.

PHILADELPHIA, HOSPITAL

General

REPORTS.

VOLUME VI.—1905.

EDITED BY

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DEPARTMENT OF PUBLIC HEALTH

AND CHARITIES,

HAVING THE CARE, MANAGEMENT, ADMINISTRATION
AND SUPERVISION OF THE

CHARITIES, ALMSHOUSE, HOSPITAL,

AND ALL OTHER SIMILAR INSTITUTIONS, THE CONTROL OR GOV-
ERNMENT OF WHICH IS INTRUSTED TO THE CITY.

DEPARTMENT OFFICE, 395 CITY HALL.

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Medical Board of the Philadelphia Hospital

PREFACE.

The Editor offers his congratulations to the Director of the Department of Public Health and Charities, Dr. Edward Martin, and to the members of the staff upon the completion of Vol. VI of the Philadelphia Hospital Reports. It is larger in number of pages and better in the quality of the contributions than the previous volume. The delay in its publication has been due largely to the fact that a special appropriation for it had to be secured from City Councils, and that this was not granted until several months after the regular appropriations for the Hospital had been passed. We are grateful for their favor, and we hope that we may be able hereafter to count upon a definite sum, so that subsequent volumes may be issued promptly.

The attention of members of the staff and friends of the Hospital is especially directed to the Report of Dr. Biggs. It shows a most remarkable improvement in the system of hospital management, for which, in the name of the staff, the Editor would like to express thanks and grateful appreciation to the Director and his assistants. No one can enter the wards without being impressed by their cleaner appearance and by the greater comfort which the patients enjoy. The confusion and noise are also less. A corps of paid orderlies and better laundry facilities would make the nurses' labors lighter and be of corresponding benefit to patients and visiting staff. In this connection two sentences from Dr. Biggs's report may be quoted with advantage to give them emphasis: "The greatest handicap to the work of the Hospital is lack of a sufficient number of paid, responsible workers. We are dependent to such a large degree on inmate labor that it is impossible to approach the standard of service which we set, and many advances planned and attempted have to be abandoned because of an insufficient number of suitable and efficient persons to carry them out."

Thanks to Dr. Biggs and to the members of the staff who have assisted him, the Hospital now has a most excellent system of indexing and filing histories, and will soon, we hope, have bound volumes of the histories, not arranged by years, but by subjects.

In conclusion, the Editor wishes to express his personal thanks to the members of the staff who have contributed to the volume, and especially to Dr. Curtin and Dr. Mills, whose unflagging interest in the Hospital and readiness to help in all matters which make for its advancement and betterment, are a continued inspiration to good work.

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AN ACCOUNT OF THE FIRST CLINICAL REPORTS ISSUED FROM THE PHILADELPHIA HOSPITAL.

By H. R. M. LANDIS, M. D.

The present account of Jackson's clinical reports has been written because, although not official, they were the first issued from the hospital. Aside from this claim to distinction, however, they have an added interest in that they give an excellent picture of the hospital as it then existed. For the most part the account has been quoted exactly, as the descriptions so nearly fit what most of' us have known as "Blockley."

The reports under consideration appeared in November, 1827, in the first issue of the American Journal of the Medical Sciences and in the February number of the same journal for 1829. and were entitled, "Clinical Reports of Cases Treated in the Infirmary of the Almshouse of the City and County of Philadelphia," by Samuel Jackson, M. D., one of the attending physicians and Assistant to the Professor of the Institutes and Practice of Medicine in the University of Pennsylvania. Jackson gave as his reasons for writing the reports, the unusual richness of the clinical material and the fact that similar reports from other institutions had lately appeared.

The first series consisted of seven cases of "continued fever," which from the descriptions given were in all probability typhoid. Jackson states that this continued fever was incorrectly called typhus, but makes no attempt to differentiate between the two conditions. The second series included thirteen cases of various conditions which presented interesting clinical or post-mortem findings. To the second report is appended the following table:

What is of especial interest, however, is the description of the hospital as it existed in those days. This makes up a large part of the first report.

The Almshouse at this time was situated in a meadow at present bounded by Spruce, Pine, Tenth and Eleventh streets, having been removed thence in 1767 from the neighborhood of Third and Pine

TABLE SHOWING THE NUMBER OF PERSONS ADMITTED INTO MEDICAL WARD OF
THE INFIRMARY OF THE ALMSHOUSE OF THE CITY AND COUNTY OF
PHILADELPHIA, AND THE NUMBER OF DEATHS BETWEEN THIRD
OF DECEMBER, 1827, AND THE FIRST OF DECEMBER, 1828

Dates of Admission	Men's Medical Ward		Women's Medical Ward		Cells*	
	No. Admit.	Deaths	No. Admit.	Deaths	No. Admit.	Deaths
From 1827, December 3, to 1828, January 7	149†	17	149‡	13	24§	1
To February 4	96	11	46	9	22	1
" March 3	60	9	61	3	26	2
" April 7	71	12	47	10	27	2
" May 5	46	9	55	4	33	1
" June 2	76	8	46	9	30	2
" July 7	64	12	48	10	24	5
" August 4	62	8	47	6	31	11
" September 1	100	10	64	10	19	4
" October 6	177	13	114	10	57	6
" November 3	145	7	88	6	24	6
" December 1	116	10	79	11	32	3

*Principally for mania-a-potu
†This number includes 88 in the wards December 3, 1827
‡This number includes 56 in the wards December 3, 1827
§This number includes 8 in the cells December 3, 1827

Remaining December 1, 1828, in the Men's Medical Ward, 54; in the Women's Medical Ward, 79 in the Cells, 11.

RECAPITULATION

Treated in Men's Medical Ward,   1162
              Deaths,   126
              Percentage,   10.84
Treated in Women's Medical Ward.   841
              Deaths,   101
              Percentage,   12.
Treated in Cells,   349
              Deaths,   44
              Percentage   72.6
Whole number of patients treated   2352
              Deaths,   271
              Percentage,   11.47

streets. Later, in 1835, it was removed to its present location. Jackson writes that: "The Almshouse of this city includes under the same roof an infirmary or hospital for medical and surgical cases, a poor house for the indigent and a workhouse for vagabonds. This last circumstance gives to it somewhat of a disreputable character, and few who have remains of a sense of decency and self-respect and desire to be esteemed respectable will seek refuge in its wards unless compelled by absolute necessity." As is well-known the last-named objection has long since been removed. The Almshouse, or outwards, however, still remains, in spite of numerous efforts to have them separated. The establishment of a modern, up-to-date, city hospital, with the stigma of the Almshouse removed, was long cherished by the late William Pepper. Recently efforts have been renewed in this direction and at present it seems probable that this will at last be accomplished.

Continuing, Jackson states: "The infirmary consists of six medical wards, three of which are appropriated to male and three to females. There are besides surgical wards and cells for lunatics."

"The majority of the patients are individuals of the very lowest order of society, many of them victims of the grossest habits of depravity and nearly all suffering more or less from intemperance.

"A large proportion of the diseases are chronic in character, the consequence of the abuse of ardent spirits, of exposure to the inclemencies of the season, of deficient or improper alimentation, etc.

"Acute diseases are rarely seen in the first week, more usually they are not brought into the house until the second, third or fourth week from the commencement, and it is very seldom the patient has not, from his habits, more or less affected the integrity of his constitution."

The following statement shows how long suffering the hospital has been under a great evil:

"It is a common practice, but which merits severe reprehension, to send patients, as soon as they are despaired of, into the Almshouse, there to die; and it has frequently happened that they have expired on the way or before they could be got into a ward.

"It has been an occurrence in one week for three patients to be sent from an institution of this city into the Almshouse, of whom one died in the yard, another on the staircase, and the third in half an hour after being placed in bed."

I imagine this was aimed at the Pennsylvania Hospital, as there was great rivalry between the two institutions at this time in the competition for students.

These statements are made "to show the difficulties that are encountered in the practice of this institution and that the mortality of the house is not to be considered as a fair standard of the deaths that occur under the courses of treatment adopted by the medical attendant."

Then as at present the hospital was "one of the best clinical schools in this country, from the number of patients brought into the medical and surgical wards, and the immense variety of the diseases that afflict human nature constantly to be found within its walls." The number of annual admissions into the Almshouse averaged above 4000, and of those into the Infirmary over 3000.

The absence of clinical records which was deplored by Jackson continued as a blot on the institution until as recently as 1896. Prior to the latter date there are no available records of any case or series of cases, except such as may exist in the private notes of visiting chiefs. This unfortunate condition of affairs is well put by Jackson: "This

institution has possessed the materials for giving complete histories
of different epidemics that have prevailed in the city and suburbs,
from the numbers of patients carried into it, as well as of epidemics that
have existed in its wards, that would have proved of the highest in-
terest and importance to the profession; but not the slightest trace of
them is to be found in any records or documents of the institution. All
its experience in this respect, as well as of the vast number of most im-
portant cases of disease has perished." In writing of the management
he says that "a laxity of discipline and want of system prevails in the
Infirmary, that is distressing and perplexing." There was no au-
thority among the physicians, the nurses or the employes. The board,
elected annually, met once a week, and was wholly taken up with
learning its duties and with administrative matters. They had no time
to attend to details and acted only on the most flagrant abuses. No
sooner had the members of the board become conversant with their
duties than their term expired, "and they were then superseded by
others ignorant of the work, and so the evil practice went on."

The medical staff at this time consisted of Nathaniel Chapman,
John K. Mitchell, Hugh L. Hodge and Samuel Jackson.

Instruction of students was carried on in the Infirmary throughout
the year. In the spring, summer and autumn months, when the class
did not exceed fifty or sixty, the students accompanied the prescriber
through the wards and clinical observations were made at the bedside.
In the winter months when the class, through the opening of the
medical schools, amounted to from 180 to 200, the most interesting
and important cases were collected in the clinical wards, connected with
which was a lecture and operating room.

During the winter months the clinics were held on Wednesdays
and Saturdays; during the rest of the year on Mondays and Thurs-
days.

The attending physician visited the wards on alternate days ex-
cept in cases of emergency; at other times the prescribing was done
by the senior resident students.

From this brief account of the prevailing conditions seventy-five
years ago it will be seen how closely the habits and traditions of the
hospital have clung to it.

There is no apparent change in the class of patients; no decrease
in the wealth of clinical material; the mortality rate remains high;
clinic days are the same, and habits, meriting "severe reprehension"
still continue.

BRADYCARDIA AS A SYMPTOM.

BY ROLAND G. CURTIN, M. D.

Bradycardia may be defined as a cóndition, more or less transient, that results, probably through some influence of the nervous system, in a reduction of the pulse rate below the number which is accepted as normal—64 to 72.

The study of bradycardia does not properly include those cases in which the patient's pulse-rate is naturally slow. Some persons have acquired a slow pulse by inheritance. In such cases the symptom is present all the time, when the patient is in health. I have seen two examples of this kind in the children of drunkards.

The interest in bradycardia has greatly increased within the last few years. The older text-books have nothing to say on the subject, or give it but a passing notice. The only articles of importance referring to it that I have seen are in the works of Dr. Sansom, of London, and in a recent book by Dr. Robert H. Babcock, on "The Diseases of the Heart and Arterial System," published by D. Appleton and Co., of New York city. The attention given to bradycardia in this book indicates an increased interest in it by clinicians. I have, during the past ten years, made some observations which are embodied in this short paper, and presented for your discussion, hoping primarily to assist in adding to the literature, and calling your attention to the importance of placing this interesting symptom in its proper position—I call it a symptom, as it cannot per se, be called a disease in the light of what we know of it.

Dr. E. W. Watson and the writer were, I believe, the first to point out the slowing influence of influenzal poison upon the heart—not, of course, in every case, but as an occasional manifestation of this strange disease.

In an article read before the American Climatological Association in Session at Washington, D. C., September, 1891, we made note of the fact that "the heart was often irregular, slow and feeble. These symptoms indicated want of nerve power rather than impaired muscle, since recovery was so generally rapid."

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Again, in another paper, read January 13, 1892, before this Association, we said that "in 1889 and 1890 several cases were seen of irregular, rapid and slowed heart. The slowing of the heart did not seem to be influenced by the temperature, but was apparently the effect of a toxine upon the nerves of the heart. The influenzal poison rarely excites the heart in an uncomplicated attack. Ordinarily the temperature may be 103 or 104½ degrees, and the pulse at the same time 70 to 85, generally about 78 to 84." Since the publication of these articles I have seen many cases of influenza that have had marked bradycardia.

In one of these, the patient, a man, aged 60 years, had for a month a marked attack of influenza, with bronchial catarrh and great nervous prostration. His temperature had for six days ranged from 103 to 105 degrees, and his pulse during the same period has been about 30. After that, it went up to the normal point.

Another case, a physician, had an attack of that disease, in which his pulse ranged from 35 to 40 for three months. At the same time he had a temperature from 1 to 2½ degrees below normal. He also had marked glycosuria, which has continued off and on since, making the appearance after indiscretions in diet. Following the early attack, he had transitory anginose symptoms.

These cases are given as examples of the influence of the influenzal poison as a cause of slowing of the heart by means of its toxic effect upon the inhibitory nerves of the heart.

You will observe that although one of these cases had considerable fever, and the other a persistent subnormal temperature, the same symptoms of bradycardia was associated with both of them.

In the Philadelphia Hospital, in the fall of 1902, a man was admitted with acute lead poisoning, accompanied with marked bradycardia. The nervous symptoms in this case were very pronounced. His pulse was slowed to between 30 and 40 during the period in which he was in the hospital. There were no symptoms of renal complication. After having been in the ward for about six days he died of nervous exhaustion, in which delirium had been a pronounced symptom.

I desire to mention briefly four cases of Stokes-Adams' syndrome— a group of symptoms prominent among which, as you know, are paroxysmal bradycardia, faintness, syncope, or epileptiform convulsions, with partial or total respiratory failure.

I have the notes of a case in which the patient, a man in advanced life, an inveterate tobacco chewer, had a severe carbuncle a year and

a half ago. Since that time his pulse has been from 35 to 40. This bradycardia came on during his convalescence, and has continued since then. He has had many attacks of marked faintness. A few days ago he fell down in the street. He is extremely weak. Otherwise, he seems to be in good health. He has since died—in 1903.

In the fall of 1902, a man was found unconscious in the street and was brought to the Presbyterian Hospital. He was 84 years old, and had several convulsions after being admitted, which were tonic in character. During the,time that he lived he had about eighteen of these convulsive attacks. His pulse ranged from 13 to 104. He had a slight systolic murmur and marked arcus senilis. His arteries were markedly atheromatous. He had used both alcohol and tobacco to excess. The case was diagnosed as one of Stokes-Adams disease. There was a trace of albumin and a few hyaline casts were found in his urine.

The following case was seen in the Philadelphia Hospital: A man, aged 62, born in Ireland; used alcohol to excess at times; no venereal history; on admission complained of giddiness, nausea, palpitation and anorexia. The most prominent physical signs were cyanosis, anasarca and slow pulse—under observation his pulse would fall to 30 or below during periodical attacks of vertigo. Without warning he was seized at the dinner table with a tonic convulsion lasting one minute. The following day he had a similar seizure, during which the pulse could not be felt or the heart sounds heard. Respiration also ceased. Under active stimulation, oxygen and artificial respiration, he became conscious and lived in comparative comfort for fifty hours, when he died in a convulsion.

I was called recently to see a woman, aged 77, who had a pulse ranging from 30 to 60—generally below 40. The heart sounds were sharp and quick, but almost inaudible. She has had three attacks of convulsions, involving the muscles of the mouth and hands, the first in last October, followed by one on November 28, and another on May 16 of this year. She did not remain unconscious for any length of time.

Bradycardia has been observed as occurring during the course of many acute and chronic diseases—typhus, typhoid and rheumatic fevers, pneumonia, diphtheria, influenza, erysipelas, dyspepsia, gastric ulcer, gastric and oesophageal cancer, debauch and delirium tremens, malaria, acute and chronic lead poisoning, apoplexy, chlorsis, anaemia, and pernicious anaemia, gangrenous enteritis, jaundice, appendicitis, sea-sickness, diabetes, brain tumours, meningitis, paresis, insanity—especially melancholia, hysteria, hypochondriasis, homesickness of young soldiers —after exhausting fatigue, confinement and excessive sexual excitement. It may also be associated with diseases of the cardio-vascular

system, arterio-sclerosis, Stokes-Adams disease and angina pectoris. It has been my experience that bradycardia is rarely noticed in uncomplicated diseases of the valves or orifices of the heart. When present it can usually be ascribed to large doses of digitalis or other cardiac remedies.

The late Dr. Eskridge, in an article on "A Study of the Temperature, Pulse and Respiration, in the Diagnosis and Prognosis of certain Diseases of the Brain" (reprinted from the New York Medical Journal, August 31, Sept. 7, 21, and 28, 1901), makes the following statements in regard to slow pulse in intracranial conditions.

"A slow pulse in organic brain disease generally indicates increased intracranial pressure. There is a probable exception in abscess of the brain, in which intracranial pressure often seems not to be increased. The slow pulse in this disease has been attributed to the poisonous and depressing effects of toxines on the brain, especially inhibiting the vital centres. It must also be remembered that a sudden increase of the intracranial pressure to such an extent as to overwhelm the functional activity of the brain, the heart uncontrolled, is allowed to beat away at its own 'sweet will.' A slow pulse of 60 to 80 is the rule in the exudative stage of acute meningitis. A pulse of from 40 to 60, especially if irregular and intermittent, as it usually is, denotes great cerebral disturbance and rapid progress of the disease. These are the cases in which sudden death often occurs, apparently from the exudate either directly or indirectly, affecting the cardiac and respiratory centres. The slower the pulse in apoplexy, the greater the probability is that the stroke is due to hemorrhage. The typical pulse of abscess of the brain is a slow pulse, until that stage is reached in which the functional activity of the brain is greatly impaired. In traumatism of the brain a slow pulse denotes in the majority of instances either hemorrhage or a depressed fracture, and, if the pulse is irregular or intermittent, that the respiratory and cardiac centres are affected.

"It would be interesting to study in detail the irregular and intermittent pulse in organic disease of the brain, as illustrated by a number of well-observed cases, but time will not permit. Suffice it to state that neither a rapid nor a slow pulse in many cases has more significance in weighing the probable outcome of a case than the degree of irregularity or intermission of the pulse. The greater the prominence of these variations from normal the graver the prognosis."

The value of bradycardia as a help in diagnosis and prognosis can be stated in a few words. Enough has already been said to indicate

that a symptom which is so common and which occurs in such a multitude of widely different diseases can be of but small diagnostic value. As an aid in prognosis it would appear that given a constitution not undermined by disease, and a gradual subsidence of the primary cause of the slow pulse, bradycardia need not necessarily be regarded as a particularly grave symptom. On the other hand, however, if it is associated with, or caused by, a depressing chronic condition, especially of the cardio-vascular system, it becomes a most serious symptom. When accompanied by anginose symptoms it is frequently followed by sudden death.

THE DELIRIUM NOTICED IN CARDIAC DISEASE.

By ROLAND G. CURTIN, M. D.

Whether or not there is a passing delirium occurring in the later stage of diseases of the heart and whether it is peculiar to this condition I find it hard to determine from a study of the literature that has been at my disposal. Cases of insanity associated with heart disease have been carefully and closely studied, but it is to an altogether different condition that I desire to call your attention. The great difficulty in studying and classifying the symptoms of advanced heart disease is that it is often hard to separate sharply the symptoms depending on the primary condition from those of the commonly associated complications.

In the histories here recorded I have made every effort to eliminate all other diseases, such as hysteria, fever, Bright's disease, rheumatism, pneumonia or pleural trouble, jaundice, blood dyscrasia, chronic alcoholism, or anything else which might possibly be a cause of permanent or transitory delirium.

These cases are quite rare so that a long time has been required to select a sufficient number to enable me to arrive at any reasonable conclusions. These cases will be given, only mentioning the salient points, in the hope that they may assist in determining the cause of the delirium. I have seen a great many cases of heart disease in my practice, but have not found more than four in which it was associated with continual insanity.

E. Regis, in his "Practical Manual of Mental Medicine," a book that is highly esteemed by neurologists, says, under the heading of Cardiac Insanity:

"Affections of the heart have, rather frequently, an injurious effect on the mind, and are capable of producing various disorders of the ideas and the emotions, from simple change of character and rudimentary morbid conceptions to confirmed insanity.

"Nevertheless, since it is hardly possible to point out exactly what cerebral circulatory disorders are produced in cardiac disease; and since, on the other hand, the disorders of the circulation that are con-

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stant as symptoms of the heart lesions, are far from causing delusional or versatile symptoms in all cases, we must recognize that the nervous system is a potent agent, if not the principal one, in the production of cardiac insanity, and this permits us to continue to consider this variety of alienation as a sympathetic insanity in the wider sense we have given to the term.

"All diseases of the heart may produce mental alienation; but those whose action in this way seems most frequent are mitral and aortic lesions. The lesions of the other cardiac orifices may, nevertheless, have a certain role; and M. Duplaix has reported in l'Encephale a case of insanity, with agitation, hallucinations of sight and hearing, and ideas of persecution, that was plainly connected with a tricuspid insufficiency.

"Cardiac insanity takes on most frequently the melancholic form, at least in the case of mitral affections; as, according to certain authors, and especially M. d'Astros, who has supported this view, the aortic cases are those of the excited types, and the mitral ones the depressed; so that the former tend rather to mania in all forms, and the latter to melancholia."

"The mental disorders that sometimes accompany the later stages of asystole have not been mentioned. In these cases we do not have a real insanity, but a sort of toxic delirium analogous to that of the last stages of phthisis.

"In a recent clinical lecture (Bulletin Médical, March, 1891), M. Huchard has shown that true cardiac insanity, which he distinguishes according as it occurs with or without asystole, is comparatively rare; and that it is of importance not to confound it with certain deliriums that occur in patients with cardiac-disease, such as cardio-renal delirium (due at once to asystole and uremia), the drug-deliriums (digitalis, belladonna, etc.), and the arthritic, alcoholic, hysterical, and puerperal deliriums. These various forms have, besides, a physiognomy of their own that allows them to be recognized with proper attention."

We have certain nervous symptoms associated with heart disease—apoplexy, epileptiform convulsions, impaired intelligence, tremors, headache, nervousness, vertigo, loss of memory, fear, sleeplessness, syncope, chorea and paralysis. With all these disturbances it would seem that the nervous system is sufficiently affected to take upon itself at least a mild delirium. In his book on Diseases of the Heart, Dr. Sansom, of London, says:

"The cerebral phenomena observed in heart disease may, for the most part, be divided into three classes. The first embraces those due to chronic disturbance of balance between the arterial and venous systems, which is the result of imperfection of the driving-power in the great engine of the circulation. The brain may suffer from a deficient supply of arterial blood, from excess of venous blood, or from these causes variously combined. Arising from these conditions, there may be increase of the fluids effused within the intracranial cavities, and degeneration of the brain-tissue, owing to the impaired nutrition."

The cases of insanity associated with heart disease that have been studied by neurologists seem to have been largely, at least, cases with good compensation and without heart-symptoms. The altered circulation might, in some cases, predispose the patient to insanity. They would not be in the same class as those here reported, where the patients were in the "slough of despond" by reason of the heart's weakness.

Some of the factors that might be assigned as a cause of the delirium are:

1. Carbon dioxide poisoning.
2. Faulty metabolism.
3. Arterial congestion.
4. Venous congestion.
5. Capillary congestion.
6. Edema of the brain.
7. Anemia of the brain.
8. Strain on the nervous system from insomnia and constant struggle for breath.
9. Dread of death.

The longer I study such cases the more I am inclined to think the delirium is unlike that of other exhausting diseases. Since we do not find the same symptoms in those conditions associated with anasarca or edema of the brain I feel sure that the cause is a nervous irritability of the brain from some toxine rather than an edematous or anemic condition.

TABULATION OF HEART CASES WITH DELIRIUM.

The salient points only in each history are given.

A. T.—A man, 48 years old, with dilatation of the right and left heart, with marked dropsy, wandered out of the room when left alone. Talked to imaginary persons, insisted on going to business.

T. W. C.—43 years old; systolic aortic and mitral disease; dropsical. He wandered all over the house; went up and downstairs. When alone threatened to kill himself by shooting or jumping out of the window. He had marked dyspnea and dropsy; was annoyed by real sounds. When he got out of bed he was bewildered and said I wanted to send him to a hospital, so that I should not have to sign a death-certificate.

J. C.—24 years old. Double mitral disease without dropsy. Would get nervour and hysterical. Afraid to go any distance from home. The morgue was a quarter of a square from his house. He would go there and stay, and talk about the unpleasant sight with glee. Kept his room almost all the time for a year. Was suspicious and irritable, and avoided observation.

J. H.—55 years. Dilatation and myocarditis. Threatened to kill himself. Awakened to find his bed on fire. Feet were supposed to be electrified, and sometimes his arms. Muttering and disgruntled. Wanted to go to work.

Mrs. S.—32 years. Mitral systolic murmur. Dropsy. Thought that there was an electric connection between her bed and the police station, and that if she moved the police would pounce down upon her and arrest her. Day after day she lay quiet, fearing to move in bed.

Mr. C.—64 years. Mitral systolic murmur, markedly edematous. Thought the family were making a brothel of his home. Sorrowful, but not vindictive. Imaginary company in his room.

L. J.—57 years. Mitral systolic disease, dilatation and myocarditis; anasarca. Awoke to find the pillows of his bed on fire. Rambled incoherently all the time. Reported imaginary grave opinions in regard to his case. This was the only case in the group that recovered.

M. G.—A woman of 62, with mitral disease and dilatation and "water-logged." Was afraid she would die. Imagined she went uptown and would relate a supposed conversation she had with people she met, and tell of numerous purchases she had made, and the streets she had traversed.

P. R.—A policeman, 48 years old, with dilatation, little edema. Would leave the house and stay all night in a barroom, seemingly for company. He was not a drinking man.

J. W.—A man of 45, with double aortic disease. Mild, rambling delirium when awakened from sleep. Easily roused.

F. D.—A woman of 64, with an aortic systolic murmur and incompetency. Marked edema. Mind constantly troubled. Was away from home. Conversed with imaginary persons.

J. L.—A man of 65; dilatation, with a systolic mitral murmur. Extreme dropsy. No idea of time. Spat medicine and food on bed and wife, and despised the minister, who called on him, and any one except the family was supposed to be the minister. Rambling all the time, but worse at night. Would stop short in the middle of a sentence.

CONCLUSIONS.

1. It seems to me that the delirium of the last stage of heart disease differs materially from those of the same stage of phthisis, cancer, per-

nicious anemia, or any other exhausting disease with or without ane-
mia. Three out of the twelve patients threatened to commit suicide,
which is very unlike the symptoms in the diseases named. The patient
is apt to be melancholy, while in phithisis, etc., the patients are usually
hopeful to the last.

2. The delirium almost always after sleeping.

3. The patient is easily aroused from the delirious state to one of nor-
mal mental activity.

4. Muttering delirium is the most constant symptom.

5. The activity of the delirium seems to bear a direct relation to the
blood supply to the brain. In the cases in which the blood was impover-
ished and the brain edematous and congested, the delirium was low and
muttering; when on the other hand the brain was stimulated with a
good supply of blood, it was surprising to see the mental activity.

6. The symptoms were quite acute and active in cases unassociated
with dropsy and great weakness, but much less so in cases with ana-
sarca.

7. The fact that three patients had hallucinations connected with
electricity made it occur to me that the numbness incident to the dis-
ease, probably from constant bed pressure, might have suggested the
thought.

8. The persons advanced in life seem to be more often affected than
those that are younger.

9. Changes or interruption of medicines does not seem to influ-
ence the delirium and all cases were not treated with the same drugs.

10. The presence of delirium in heart disease is a very grave symp-
tom, as shown by the fact that only one patient in twelve rallied so
as to be able to go about again.

I have often been struck with the mental ability of some of those
whose lives have been dwarfed by congenital heart disease. The body
is crippled, but the brain is capable of doing good work. So far as
my observations go this is not true of heart cases suffering from ac-
quired endocardial disease.

THE DIAGNOSIS OF TUMORS OF THE CEREBELLUM, ESPECIALLY WITH REFERENCE TO THEIR SURGICAL REMOVAL.*

By CHARLES K. MILLS, M. D.

The diagnosis of the existence of a tumor in the cerebellum or the cerebellar peduncles is as a rule comparatively easy, but to exactly locate and infer the size and extensions of such a growth is a more difficult task; and yet when operation for the removal of the tumor is under discussion, the focal diagnosis becomes of paramount importance, and will therefore be the chief concern in this paper. In the first place, however, in order that my special subject may be clearly presented, brief consideration will be given to general diagnosis. In a large majority of cases of cerebellar neoplasm the well-known general symptoms of brain tumor, namely—headache, nausea, vomiting, vertigo, and optic neuritis are present, and are of pronounced character.

While the headache in many cases is intense, and in some even agonizing, in others it is of moderate severity; and in rarer instances, of which a few have come under my observation, it may be entirely absent or it may not appear until late in the course of the disease. In about half the cases the headache is referred to the back of the head or to this region, and at the same time to other parts, as the nape of the neck and various portions of the cranial vault. Frontal headache of a severe type is occasionally observed in cases of cerebellar tumor, just as in some instances of frontal neoplasm the pain is most intense or present alone in the occipital region. Too much stress, therefore, must not be placed on the site of the pain.

Nausea and vomiting are symptoms of frequent occurrence, although they occasionally disappear for long periods in the progress of a case. The mechanism of these symptoms is much the same as that of the vertigo, which will next be considered.

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* This article is part of a paper on tumors of the cerebellum and cerebellopontile angle, which appeared in the New York Medical Journal, February 11 and February 18, 1905. The paper as published in the Journal was accompanied by a series of cases by Dr. Charles H. Frazier and the writer.

The vertigo, which is so frequent a general symptom of brain tumor, wherever situated, is usually due to irritation of branches of the trigeminal nerves, which are situated near the inner surface of the dura, the irritation of the fifth nerve being reflected to the bulbar nuclei of this nerve and thence to the pneumogastric nucleus. This is usually one of the causes of the vertigo in tumors of the cerebellum when the growth is connected with the dura, which is not the rule. In other cases it should be regarded as a focal rather than as a general symptom of tumor, as it is caused by the disturbing influence exerted by the tumor upon the cerebellovestibular apparatus—a point which will be referred to at more length.

A distinction must always be made between cerebellar vertigo and cerebellar ataxia, although the two are often so interblended that this is not easily done. Subjective vertigo is common, the patient usually describing it as a feeling of dizziness. Both subjective and objective vertigo may be extreme and exhibit striking characteristics which indicate their focal origin. In a case reported by Osborne,* for example, in which a large glioma was located in the right cerebellar lobe, the patient was unable to sit up and could not turn her head without having an attack of vertigo. The dizziness was relieved by complete rest in bed, but came on again with less frequency although with much severity. The patient would always lie with her head to the right, saying that she became dizzy if she turned to the left. Later epileptoid seizures took the place of the vertigo.

With regard to optic neuritis and its consequences, it is only necessary to say that my experience is similar to that of others who have found this sign of intracranial tumor more constant in cerebellar tumors than in those located in any other region of the brain. The development of the optic neuritis is often rapid, or at least goes on at a much accelerated pace after it has reached a certain moderate height. The choking of the disc is extreme, and hemorrhages are numerous. Unless operative interference checks the progress of the inflammation, blindness speedily occurs, and this is one of the reasons for early surgical procedure even when the case has not a hopeful outlook as regards removal of the growth.

The question of the existence of a true paresis or paralysis as the result of a cerebellar lesion is one that has been discussed both by physiologists and clinicians. That a general paralysis has been ob-

* Journal of Nervous and Mental Disease, N. Y., vol. 29, Oct., 1902.

served as both the result of experimental lesions of the cerebellum, and of cerebellar hemorrhage, tumor or abscess, in man cannot be doubted; but in many cases at least this symptom is due to the effect of the lesion on neighboring parts, as for instance, on the pyramidal tract or tracts. Asthenia or muscular weakness is, however, a real cerebellar symptom. Sometimes it is overlooked, the symptoms which are dependent upon this weakness being attributed to incoordination or other cause.

In a valuable paper by Grainger Stewart and Gibson* to which reference will be again made, these writers report at length their observations with regard to the state of voluntary movements in the five patients which form the basis of their paper. These observations are of so much interest that we take the liberty of citing them at length.

"Voluntary movement. (a) In all five cases there was distinct weakness of the legs. This was manifested, not only in the patient's equilibration and gait, but also in the movements when lying in bed.

(b) Weakness of Spinal muscles. This was present in three of the cases; in one of them the effect of letting the patient use crutches was tried, and unmistakable relief followed; but in the other two we found no distinctive evidences of such weakness.

The importance of this symptom was pointed out by Niemeyer, who insists upon paresis of the muscles concerned in bending, erection, and lateral movement of the spinal column, passing into an utter inability of the body to maintain itself.

Hughlings Jackson has long held that destructive lesions of the cerebellum, or at least of its middle lobe, give rise to true motor paralysis or paresis, in which the trunk muscles are first and most affected, those of the inferior extremities next in order and severity, and those of the superior extremities last and least. The experimental investigations of Risien Russell, which will be discussed below, appear to support these views.

In the case already referred to, Hughlings Jackson and Risien Russell observed that, while the muscles of the arm were unaffected, and those of the legs were sightly impaired, those of the trunk were so weakened as to give rise to lordosis.

It is interesting to notice what relief is afforded to this symptom by letting the patient walk with crutches, or by holding up the head, or by allowing it to rest on some fixed object. We have sometimes seen a

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* G. Grainger Stewart and G. A. Gibson, Edinburgh Hospital Reports, vol. 5, Edinburgh and London, 1898.

patient who habitually staggered like a drunken man walk steadily when supplied with crutches, and have greatly assisted others by putting the hands in the axillae, or by holding the head firmly on each side.

We do not feel certain that this is explained by the relief it affords to the weakened spinal muscles, for we have seen great comfort follow the mere pressure of a finger over the occipital protuberance, but the question merits further investigation.

(c) Weakness of the facial muscles was only seen in one case, that of G. K., and remained unchanged after the successful result of the operation." (Stewart and Gibson).

Batten* has called attention to what he believes to be the diagnostic value of the position of the head in cases of cerebellar disease. He refers to the fact that Risien Russell has observed in animals after ablation of a cerebellar hemisphere that the head sinks on the shoulder on the side on which the operation is performed, the eyes being deviated to the same side and upward, and the chin to the opposite side. The spinal column is concave on the side of the ablation. Batten observed a case of tubercle of the right lateral lobe of the cerebellum in which the patient's head sank toward the left shoulder, the face looked upwards toward the right and the chin rotated to the right. The spinal column, as in animals experimented upon, was concave toward the sound side. The same symptoms have been observed by Batten in hydrocephalus. My attention has not been directed to any case of cerebellar disease in which this sign of turning or sinking of the head to one side was present, although it has been looked for by me in recent cases. At the meeting of the St. Louis Medical Society, September, 1904, at which the subject of cerebellar diagnosis was introduced by the writer, Dr. J. J. Putnam, of Boston, spoke of a case in which this symptom or some modification of it was present.

The ataxia may be exhibited in a generally inco-ordinate station or gait, or it may be associated with a special tendency to pitch or fall forward, backward, or to one side. The tendency to pitch forward or backward is usually found in tumors of the middle lobe.

The symptom known as hemiasynergia, first described by Babinski, who believes it to be present on the side on which a cerebellar tumor or other lesion exists, has been sought for in all cases of cerebellar tumor recently observed by me, but so far it has not been found a reliable sign of cerebellar disease. This symptom is brought out by hav-

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* Batten, T. E., Brain, Part 101, Spring, 1903.

ing the patient, with his eyes shut, flex the leg fully on the thigh and the thigh on the abdomen, and then require him to extend the limb to its full length. If the extension is done normally, the leg and thigh movements are performed synergically; if hemiasynergia is present the leg and thigh are not extended synergically, but the leg is first straightened out and then the limb is brought to a horizontal position by a second movement. I have noted the presence of this symptom in several cases, but in some instances when shown at one examination it would fail to be elicited at another in the same extremity. It was present on the side of the lesion on several occasions when the one of the cases recorded in connection with this paper was examined. On other occasions the limb was extended synergically. Shortly after eliciting the sign at an examination made in the ward of the hospital, this patient was taken before the class in the hospital amphitheatre, and hemiasynergia could not be demonstarted. In the case of Spiller, it was present on the side of the tumor and was observed by the writer.

My experience indicates that the muscular sense is not lost in cases of cerebellar disease, at least not in the same fashion as it is from disease of the postparietal region. The patient may be ataxic as well as asthenic and atonic, and yet on testing him carefully for the muscular sense or its components the so-called senses of pressure, weight, posture, location, etc., may be found to be wanting. Grainger Stewart and Gibson carefully tested the muscular sense and found it unaffected in their five cases. Others have recorded the loss of muscular sense in cerebellar lesions, but as a rule without any details, and it is a question whether in some of these cases the loss of the muscular sense has not been confounded with other manifestations, as ataxia.

Stereognostic perception is also unaffected in tumors and other lesions of the cerebellum—a most important point to remember when differentiating between tumors of the superior parietal region and cerebellar growths. I have placed on record a considerable number of cases in which loss or impairment of the muscular sense and astereognosis have been present as the result of postparietal lesions, and have seen many other cases not yet recorded, but I have still the first case to see in which these disturbances or disorders were producd by cerebellar disease.

Tonic spasms or contractures may be observed in cerebellar tumors on the side of the lesion or sometimes on both sides. They are, however, not infrequently absent, or may be transient or may occur late.

Rigidity of the neck with retraction of the head and even opisthotonos or pleurothotonus may be present.

Nystagmus is one of the most frequent symptoms of cerebellar tumor. It is present in growths variously situated in the cerebellum or jointly in the cerebellum and adjacent parts, as for instance in the middle lobe, in one lateral lobe when the neoplasm is close to its junction with the middle lobe, in the prepeduncle or jointly in this and the oblongata. A tumor or other lesion confined to the flocculus is said to give rise to nystagmus. The nystagmus of cerebellar or cerebello-pontile disease may be of various types, as regards the manner of its occurrence, its direction and the rapidity or slowness of the oscillations. It may be present when the eyes are quiet and looking straight forward, or under these circumstances it may be absent, but capable of being elicited by having the eyes turned either to the right or to the left, or outward or downward. It may be horizontal or vertical or both in the same case. The movements are sometimes rapid and fine or slow and comparatively coarse. In the case of Bruce, referred to later in this paper, the nystagmoid movements which were present in all positions were increased on lateral movements; on looking to the right the oscillations were slower and larger. They were of intermediate rapidity and extent in looking upward and downward. It has been suggested that the nystagmus can be brought out when it is not present, or that it is greater if present, when the eyes are turned toward the side of the lesion, a view which was supported by one case of cerebellar abscess recorded by Spiller'* but was not confirmed by a case of cerebellar tumor reported by this writer in the same paper. We have not been able as yet to make any inferences of localizing value from a study of cerebellar nystagmus, although it would seem probable that in a case of destructive lesion affecting the cerebello-vestibular tract, the nystagmus would be greater when the eyes were directed toward the side of the tumor.

The neural symptoms may be referable to any of the cranial nerves or their connections from the third to the twelfth. Among the most frequent are those indicating paralysis or paresis of associated ocular movements, paresis of the musculature supplied by the sixth or the seventh nerve, impairment of hearing from implication of the cochlear portion of the eighth nerve, disorders of taste due to involvement of the glossopharyngeal or chorda tympani, and loss or perversion of sensa-

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* Spiller, W. G., Amer. Jour. Med. Sciences, Feb., 1904.

tion because of trigeminal disturbance. The nerves, their roots, or the tracts with which they are connected in the oblongata pons may be involved separately on conjointly. When the neural symptoms are due to pressure they are probably usually to be referred to direct nerve or nerve-root involvement. While unilateral symptoms may point to true nerve implication, this distinction is by no means a sufficient one, as tumors of the cerebellum not infrequently involve jointly one lobe, one peduncle, and one side of the oblongata or pons.

Among the ponto-oblongatal pressure symptoms which may result from a cerebellar tumor are hemiparesis and vasomotor, cardiac and respiratory disturbances. Convulsions, unilateral or general, but more commonly the latter, with unconsciousness, have occurred in about one-half of the cases which have come under my observation. Hydrocephalus complicating a case of cerebellar tumor may obscure the diagnosis and may give rise to special symptoms such as rigidity or spasticity and loss of sight or smell from compression, although the last two symptoms may be present in the absence of hydrocephalus.

With our present knowledge and views regarding the anatomy and physiology of the cerebral olfactory apparatus, it is at times difficult to determine how the loss of smell which is so common in cerebellar tumors is produced. In some cases it may originate in much the same way as optic neuritis and blindness occur, that is, from neural inflammation or from nerve choking.

With regard to the deep reflexes, little that is of value in focal cerebellar diagnosis is as yet at our command. We have observed the knee jerks lost, exaggerated, crossed and differing on the two sides, either as regards loss, impairment, or increase. Unilateral differences are sometimes of corroborative value when the question of the side on which a tumor is situated is under consideration. In one of the cases recorded in this paper, for instance, the knee jerk was exaggerated on the side opposite to that on which the tumor was presumably situated, probably because the neoplasm exerted pressure downward on the pyramidal tract before its decussation. The Babinski response is usually absent, although it was present on the side opposite the lesion in one case. The superficial reflexes are usually unchanged.

In somewhat rare cases swallowing is interfered with probably because of direct or indirect involvement of the oblongata or of the nerve concerned with the fuction of deglutition. Incontinence of urine and fæces is present in a few cases apparently as symptoms referable to the presence of the tumor. Such incontinence is, of course, present

in cases of tumor of the brain, no matter what its situation, when the disease has advanced to such a point, or the suffering of the patient has become so great that the patient's mind is obtunded. In two of the five cases recorded by Grainger Stewart and Gibson incontinence of urine and fæces was noted.

It is important to discriminate both in physiological experiments and in clinical medicine between the immediate or acute effects of a lesion of the cerebellum and the later more permanent effects. The following from the writer's book directs attention to this point:

"One of the differences between Luciani and Ferrier is as to the immediate effects of cerebellar lesion. Luciani regards these as irritative, while Ferrier describes them as dynamic or inhibitory. These immediate effects have been described in much the same way from the days of Flourens and Magendie to the present time. In dogs, as detailed by Luciani, they are disquietude, frequent howls, pleurothotonus, tonic extensions of the anterior extremities, and a tendency to roll from one side to the other. After total extirpation of the cerebellum, the symptoms are bilateral, and pleurothotonus is replaced by opisthotonus, and in monkeys the tonic extensions of the extremities are replaced by tonic flexion. Experimenters are in general accord in stating that lesions of the cerebellum do not produce sexual or psychical manifestations, nor discoverable impairment of special sensibility, nor of any of the forms of cutaneous or muscular sensibility. An important fact is that one-half of the cerebellum exerts its influence on the same side of the body as itself, its action on the spinal cord being direct and not crossed. According to Luciani, the permanent effects of cerebellar ablation— the effects which persist after the irritative phenomena have subsided— can be arranged in three classes, which he describes as: (1) asthenic, (2) atonic and (3) astatic, regarding the three as simply external phenomena of one internal morbid process. The animals showed extraordinary disturbance of station and locomotion, and long persistence of unsteadiness of the trunk and limbs upon effort. According to Ferrier, the animals operated upon retained muscular strength, Luciani believing, however, from his own experiments that this was much impaired. Luciani also differs from Ferrier with reference to tonic contractures believing them to be present."

(Mills, C. K., The Nervous System and its Diseases—p.p. 377, 378.)

In connection with the general discussion and symptomatology of tumors of the cerebellum the following table from the paper by Stewart and Gibson will prove useful, as it embodies the results of a very carefully studied series of cases.

TABLE SHOWING THE NERVOUS SYMPTOMS IN FIVE CASES OF CEREBELLAR DISEASE.

		I.K.	W.B.	J.M.	J.E.	G.K.
Sensory Functions.	Headache	*	*	*	*	*
	Giddiness	*	*	*	*	*
	Sensibility Good	*	*	*	*	*
	Double Vision	..	*	..	..	..
	Nystagmus	*	*	*	..	*
	Optic Neuritis	*	..	*	*	..
	Deafness	*	..	..	..	*
	Integrity of Muscular Sense	*	*	*	*	*
Motor Functions.	Vomiting	..	..	*	*	..
	Impaired Deglutition ..	*	..	..	..	..
	Incontinence of Urine or Fæces	..	..	*	*	..
	Superficial reflexes unaltered	*	*	*	*	*
	Knee-jerk, exaggerated	*	*	..	..	*
	Knee-jerk, lost	..	..	*	*	..
	Ankle-clonus	*	*	..	..	*
	Weakness of Legs....	*	*	*	*	*
	Weakness of Face Muscles	..	..	..	..	*
	Weakness of Spinal Muscles	..	*	*	*	..
	Staggering	*	*	*	*	*
	Romberg's Symptom .	*	*	*	*	*
	Impairment of Co-ordination	*	*	*	*	*
Vasomotor and Trophic Functions.	Wasting	..	..	*	*	..
Cerebral and Mental Functions.	Alteration of Speech...	*	..	..	*	..
	Hebetude	*	*	*	*	*

With regard to the symptomatology of tumor of the cerebellum, it may be remarked that the facts obtained by experimental physiologists, as by Luciani, Risien Russell, and Ferrier and Turner, are in accord with those of clinical medicine, or perhaps it would be better to say the latter are confirmative of the former. In the valuable paper of Grainger Stewart and Gibson the results obtained by Luciani and Risien Russell are considered at length and are correlated with the symptoms presented in the cases reported by these writers. The ex-

periments summarized included mesal section, removal of the posterior middle lobe, of the whole middle lobe, of one lateral lobe, of both lateral lobes, of one-half of the cerebellum and of the whole cerebellum. Stewart and Gibson put in the form of a table, which is given below, the experimental results elicited by Luciani and by Risien Russell.

TABLE SHOWING THE SYMPTOMS PRODUCED BY EXPERIMENT.

	Mesial Section.		Posterior Middle Lobe.		Whole Middle Lobe.		One Lateral Lobe.		Both Lateral Lobes.		Half Cerebellum.		Whole Cerebellum.	
	L.	R.	L.	R.	L.	R.	L.	R.	L.	R.	L.	R.	L.	R.
Anesthesia				*		*		*		*		*		*
Nystagmus				*		*	*	*		*	*	*		*
Reflexes all increased						*				*				*
Reflexes increased on side of lesion			*				*				*			
Reflexes diminished on opposite side								*						
Paresis				*		*		*		*		*		*
Asthenia	*				*		*				*		*	
Atonia	*				*		*				*		*	
Astasia	*			*	*	*	*	*			*	*	*	*
Rigidity	*				*	*	*			*	*	*	*	*
Circus movements								*						
Body curved towards lesion							*				*			
Body rotated from lesion							*				*	*		
Proptosis				*										
Ocular deviation	*			*		*		*		*		*		*
Squint					*						*		*	

In time it is probable that as regards tumors of the cerebrum, especially those located on its lateral aspect anywhere from the cephalic tip to the occipital pole, success both in diagnosis and in operative treatment will reach from twenty-five to fifty per cent. By success is meant the exact localization and removal of tumors, the operation from the surgical point of view being entirely successful, and par-

tially so from the point of view of the removal of the disease. Supposing that fifty per cent. of such cases are reached, ten to fifteen per cent. will not recur, or at least not in periods varying from three to ten years. In the remainder the painful and distressing general symptoms of brain tumor will be removed for a time, the neoplasms recurring in some cases after an interval, while in others the cases may terminate fatally. Life in most instances will not only be prolonged, but will be made much more comfortable. Tumors of the mesal aspect and of the base of the brain will always be uncertain in result, although an occasional growth situated on the orbital or temporal surface may be successfully reached. We must therefore, after growths located on the lateral aspects of the cerebrum, look to tumors of the cerebellum and cerebellopontile angle for our next highest percentage of successes, in spite of the hitherto unsatisfactory and in some instances even disheartening results of surgical procedure.

Starr* in a collection of 377 cases of brain tumor in which operation was performed, records the results in fifty-eight cases of tumor of the cerebellum. In sixteen the tumor was removed and the patient recovered; in eight it was removed and the patient died; in twelve it was found but could not be removed; in twenty-one cases it could not be discovered.

Von Bergmann records that in twelve cases of cerebellar tumor in which operation for removal was performed, five died from shock. Either in direct experience or in that obtained in consultation and in opportunities afforded to see operations performed by others, I have seen deaths result from shock, hemorrhage from bony sinuses of unusual development, from prolonged operation, and from unknown causes. One reason for lack of success in cerebellar operations for tumor is found in the fact that these growths are frequently, if not usually, infiltrating sarcomata or gliomata.

Although operation is difficult and often unsuccessful, tumors in certain cerebellar locations may be regarded as operable. These are: (1) Tumors situated wholly or in large part in one lateral lobe; (2) tumors situated upon, or in large part invading the vermis or middle lobe; and (3) tumors of the cerebello-oblongatopontile angle. Only in the case of a tumor located in large part in one lateral lobe of the cerebellum does operation afford a really good chance for success, but in rare cases both tumors of the vermis and of the cerebellobulbar angle can be reached and removed.

*Starr, G. A., Organic Nervous Diseases, N. Y., 1903, p. 619.

It is stated by not a few of those who have written about the functions and lesions of the cerebellum that, especially in the case of tumors, it is sometimes difficult to know on which side the tumor is located.

In two cases reported by Schede* because the patient tended to fall toward the left, the tumor was located on the right, and in both cases · operation showed that it was situated on the left. In one of these cases the tumor could have been successfully removed. In several cases of which the writer has personal knowledge, the focal diagnosis was wrong as to the side on which operation was performed, although we should certainly have the data to enable us to avoid this mistake, one which is not make by skillful diagnosticians with regard to any other region of the brain, unless it is occasionally the prefrontal.

A tumor circumscribed to one lateral lobe of the cerebellum may not cause symptoms of diagnostic value. This would seem to be a correct conclusion from a study of cases and of the contributions of such distinguished authorities as Nothnagle, Bruce, Luciani, Ferrier and Turner and others. When it is said that a lesion thus located and thus circumscribed does not cause symptoms, it is meant, of course, symptoms which clinicians have learned to recognize. It would perhaps be more exact to state, as will presently appear when the views of· Bruce are considered, that a tumor circumscribed to the outer portion of one lateral lobe does not give symptoms detectable by usual diagnostic methods. If the growth involve that region of the lateral lobe near the vermis where it is situated, a portion of the cerebellospinal and of the cerebellovestibular apparatus concerned with co-ordination and equilibration, a marked and more or less unilateral symptomatology may be present.

The cortex of the vermis contains the termini of at least six different tracts from the spinal cord. Bruce† holds that the direct cerebellar tract and the anterolateral tract of Gowers which go to the cortex of the middle lobe are concerned with the muscular sense. These tracts are afferent to the cerebellum. Another tract connects the nucleus of Deiters, which is one of the end nuclei of the vestibular nerve, with the roof nuclei of the cerebellum. One tract from the nerve, with the roof nuclei of the cerebellum. One tract from the the spinal cord; another tract sends fibres to both the sixth and the third nuclei. The first of these tracts, which has been given the name cf the vestibulo-spinal tract, has been traced to the lowest part of the

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* Deutsche med. Wchnschr., July, 1900, No. 30.
†Bruce, Trans. Edinb., Medico-Chirurgical Soc., Jan., 1899.

thoracic cord, and gives off fibres to the anterior cornua, these distributions being to the same side of the spinal cord as the nucleus. The third connection of Deiters' nucleus is with the roof nucleus of the middle lobe of the cerebellum. This tract is efferent. The cortex of the middle lobe of the cerebellum is connected by sagittal fibres with the roof nuclei.

The dentate nucleus is the chief seat of origin of the prepeduncle, fibres passing by way of the prepeduncle to the red nucleus and to the thalamus. This nucleus being situated partly in the middle and partly in the lateral lobes, a tumor situated deeply enough to invade it or fibres passing from it to the prepeduncle will cause disturbance of equilibration of a peculiar kind.

"We may expect," says Bruce, "disturbances of equilibrium to be produced by symmetrical lesions situated within an area bounded by the intracerebellar path of the two inferior peduncles, of the two superior peduncles, and the dentate nuclei, in which the latter arise. This area contains the middle lobe (superior and inferior vermis, the roof nuclei, and the sagittal fibres connecting the latter with the cortex), and the cerebellovestibular tracts from the roof nuclei to the nucleus of Deiters. Lesions within this area may produce no such disturbances, provided they are symmetrically situated with reference to the mesial plane, and especially if their growth is so slow that compensation is established par passu with the disturbances they may tend to cause. On the other hand, lesions situated in the lateral lobes may produce no disturbance of equilibrium, provided they are situated entirely external to the intracerebellar paths of the upper and lower peduncles, and of the nucleus dentatus (area of possible latency). If, however, these structures are interfered with, either by pressure or by direct involvement, then the characteristic symptoms of cerebellar disease will be produced, and will depend in their character and amount on the nature and extent of this interference. If the cerebellovestibular tract, or Deiters nucleus, be injured, then the usual stimuli will not pass either to the anterior cornua of the cord or to the sixth (fourth) or third nuclei. Hence may result the weakness of the same side, the tendency to fall to that side, the impairment of the conjugate deviation to that side, the tendency of both eyes to be directed to the opposite side, and the lateral nystagmus which occurs, especially when the eyes are directed toward the same.

In what is here said the tumor is regarded as acting destructively, but if it act as an irritative lesion it may cause rigidity or spasm of the

same side, with a tendency to fall toward the opposite side, the eyes being turned to the same side by irritation of the sixth nucleus of that side.

It may be asked, how is one to determine whether the tumor is acting as an irritative or a destructive lesion? The answer to this should be found in a study of the spastic or nonspastic condition of the limbs of one side, and a careful consideration of the side to which the eyes are turned.

In the case of Spiller, which was operated on by Dr. Frazier, the patient tended to always pitch or fall toward the right, and the tumor was found at necropsy on this side.

Bruce* has recorded a case of cerebellar tumor in which the principles of localization as regards fixing the side on which the lesion occurs were successfully put into practice. In this case, a man thirty-four years old, five years before coming under the care of Dr. Bruce, had begun with impairment of hearing in the left ear, which in three or four days became absolute deafness on this side. The deafness continued, but no other symptoms developed for three years, when he began to have trouble in walking in the dark or riding his bicycle, because of a tendency to pitch toward the left side. The patient noticed also that he required to make a special effort of the will in order to use his left arm or leg. His gait gradually became worse, and his face was twisted to one side, perhaps the left. Seven months before coming under observation he had spells of vomiting. Later he had severe left-sided occipital headache, and also attacks of transient dimness of vision, this becoming more continuous and increasing in the right eye. Examinations showed a continuous, slightly subnormal temperature (97.4 F.). Other symptoms developed were gnawing pain in the lower part of the back, severe left occipital and parietal pain, with also tenderness on percussion, anesthesia of the left conjunctiva, loss of the sense of position in the left arm, complete deafness on the left side, impairment of taste, especially in the anterior two-thirds of the tongue, slightly nystagmoid movements in all positions, the field of vision on the right gradually contracted, that on the left being lost on the temporal side and gradually reducing on the nasal, a suspicion of drooping of the right upper lid, the left pupil larger than the right, with more feeble reaction on the right than on the left, both reacting promptly to convergence, partial paralysis of the left

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* The Scottish Medical and Surgical Journal, Sept., 1899.

side of the face, tremor of the left arm on attempts at touching an object, much like that seen in disseminated sclerosis, and optic neuritis with some atrophy.

With regard to tumors of the vermis or middle lobe, the writer has had no personal experience with operative procedure. I believe, however, that in some instances tumors resting upon or even invading the vermis may be reached and removed. The operation in this case should include an opening on each side of the median line, and possibly the ligation of the sinus and the removal of the bone intervening between the two openings. That such an operation is feasible, although difficult and dangerous, has been demonstrated on the cadaver by Dr. Keen and Dr. Frazier.

The diagnosis of a tumor confined to the middle lobe is relatively easy, and has already been indicated in references made to the two articles by Bruce. In one of three cases recorded by Preston* a tumor of the vermis, probably operable, was revealed by necropsy. This case exhibited abolition of muscular sense in both arms and legs, with inability to stand or walk, and a tendency to always fall backward, never to either side. Necropsy showed a bilobar tumor compressing the vermis like a saddle in its inferior part. It also exerted some compression upon the quadrigeminum; it apparently had attachments to the callosum falx and tentorium.

Occasionally tumors of the vermis are of such a character that if they could be reached by operation exposing the middle lobe they might be removed. In a case recorded by Oliver† the tumor could probably have been removed. It was large and encapsulated, and was situated between the vermis and the overlying cerebral hemisphere. On carefully dissecting, the growth was easily shelled out of its bed, having only the slightest connection with the brain substance.

A few words might be said about the diagnosis of cerebellar neoplasms from tumors situated in one or two other regions of the brain. Tumors situated on one lateral lobe but invading deeply, so as to involve the cerebellovestibular apparatus, and perhaps the vermis, may need to be differentiated from tumors of the superior parietal region. The chief diagnostic points in favor of the tumor being cerebellar are the absence of astereognosis and of cutaneous sensory symptoms. The muscular sense, according to some authorities, but not according to my own experience, may be lost in tumors of the middle lobe of the cere-

* Alienist and Neurologist, St. Louis, April, 1892.
†Philadelphia Hospital Reports, Vol. 4, 1901.

bellum, as it is in parietal tumors, but stereognostic perception and cutaneous sensibility are not disturbed in cerebellar tumors. Nystagmus, as a rule, is not present in parietal tumors, although this is a rule not without exception, especially if the tumor should extend far enough backward to involve the visual motor region of the cerebral cortex. Optic neuritis is not likely to be so intense and so rapidly to advance in parietal as in cerebellar growths, but this differential point cannot be absolutely depended upon, as severe neuritis is occasionally present in a tumor situated anywhere within the brain. Vertigo may be present in a parietal tumor, but the peculiar and extreme form of vertigo which has been described as due to disturbance of the cerebellovestibular tracts and centres is not observed in parietal cases. These cases are generally more distinctly unilateral in their symptoms, although unilaterality is occasionally quite marked in cerebellar tumors. The invasion symptoms of parietal tumor will help in the diagnosis.

Tumors of the cerebellum need occasionally to be differentiated from prefrontal growths. This diagnosis is difficult only when the tumor is confined to the external portion of one lateral lobe, so that the symptoms given, such as ataxia and nystagmus, are but little marked, or not present at all. In my personal experience I have seen but little of the frontal ataxia of Bruns; so little indeed as to make me doubtful of its existence as a true ataxia. The symptom when present is probably a pseudoataxia due to the impaired mentality of the patient, in consequence of which his powers of attention and inhibition are so affected that he does not govern his movements normally. When a prefrontal growth is situated on the left, mental symptoms of a distinctive character are present, these being absent in cerebellar growths. If the prefrontal tumor invade backwards, aphasia, agraphia and motor paralysis may ensue. In cerebellar tumors the mental state and the motor state are both those of asthenia rather than true psychical disturbance or paralysis. The cerebellar patient is often feeble in pursuing his mental processes, which, however, are usually clear. Similarly, his legs and arms are often weak and asthenic rather than paralyzed. When a prefrontal tumor is situated on the right side the focal symtoms are often almost entirely absent, and in such a case a tumor of one lateral lobe of the cerebellum with a latent symptomatology might be confused with the frontal growth. Sooner or later, however, invasion symptoms would help out the diagnosis.

Tumors of the cerebellum and hydrocephalus may be confounded. In one case of this kind seen by me the patient had several of the typical symptoms of brain tumor.

THE NEURON AND NEURO-FIBRILLARY THEORIES OF THE NERVE CELL, WITH SOME CONSIDERATION OF NEURAL ENERGY AND NEURAL MECHANISMS.

By CHARLES K. MILLS, M. D.

As early as 1872 or 1873 Golgi, the Italian histopathologist, had discovered a method of staining nervous tissue with silver nitrate; and using this mode of impregnation, details of structure never before seen, or even thought of, were revealed. By means of this method the neuron as now known, the nerve cell with all its processes, was first observed appearing as a beautiful silhouette, although Golgi himself did not recognize the separate existence of this neuron. More than a decade passed before the attention of the scientific world was centered upon Golgi's discovery and its wonderful possibilities. Golgi believed that the protoplasmic processes (dendrites) of the cell body were altogether nutritive in function, that they simply passed out from cell bodies, to be connected with blood vessels and neuroglia cells with the purpose of maintaining the nutrition of the cell. He assigned to these processes no neural functions. That axons had lateral branches or collaterals was first shown by him. He believed that the axons and their branches were the true conductors of nerve energy, but was somewhat obscure in the manner in which he described how connections were made between different cells and their processes. He described in detail cells of the pyramidal system and of the ventral horn of the cord, and also others of different type, and made a subdivision into motor and sensory cells largely based on the length of the cell processes. His views regarding the nutritive and conducting portions of the cell, and also as to motor and sensory cells have not been fully sustained, although some of his hypotheses and his expressions of doubt as to the full acceptation of the neuron theory are receiving renewed attention in the light of the most recent discoveries regarding intercellular and intracellular networks, and the alleged fibrillary connections of cells. He did not acknowledge that cell processes had free terminals. He believed that the axons of his motor cells, after

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giving off their branches, simply became a medullated fibre, and that in his so-called sensory cells the processes subdivided into fibrils, again coming together to form a fibre.

Among the facts which contributed, although perhaps without appearing to do so, to the development of our present conceptions of the nervous system, based on the neuron and the neurogliar theory, were researches and publications concerned with the cell as a vital unit, the animal cell wherever found, of such investigators as Schleiden, Schwann, Virchow, v. Koelliker, Lockhart, Clarke and others of almost equal importance. Preceding even Deiters were also the well-known observations on degeneration of Waller and of Turch and their schools, and the atrophy observations of v. Gudden and his pupils and disciples. These observations on degeneration and atrophy pointed definitely to some central trophic region related to the parts which degenerated or involuted after so regular a manner. The idea of physiologic and anatomical systems and of system diseases sprang largely from observations of this sort, and these views, with the facts and conclusions reached by Flechsig regarding the existence of embryonal system as determined by periods of medulation can easily be seen now to be forerunners of the neuron conception, although their relations to this conception were not seen until the idea that fibre tracts and peripheral nerves were constituted of the processes of nerve cells was established.

The discovery of the true significance of Golgi's new method of staining, what might indeed be termed the discovery of Golgi himself by the world of science, was chiefly the work of Forel, His and Nansen, although some imperfect recognition of his work had been grudgingly or skeptically given previous to the first writings on the subject of these well-known scientists. Forel, from a study of specimens stained by Golgi's methods, and from investigations by the methods of von Gudden, arrived at conclusions radically different from some of those promulgated by Golgi. He was apparently the first to show that the connections, or rather interrelations, between cells were by contact, and not by continuity of structure. He held also that all neurofibrils were derived from the processes of cells, and ended free in tufts or brushes. He advanced the view that the networks of Gerlach and of Golgi were not true networks, but rather collections of independent nerve processes and their branches, the separate identity of which could not always be traced by the methods in use. He showed also that any part of a cell cut off from its nucleus would degenerate. Forel was the first to use studies in secondary degeneration in support

of the neuron doctrine. He showed that true degeneration with absorption reached as far as a single nerve unit, although a species of degeneration or involution also took place in other nerve units connected in chain or series with the first. In the experiments of von Gudden and von Monakow, for instance, extirpation of the eye resulted in a true degeneration of the latter, being of the gelatinous substance which corresponds to the terminal arborizations of the peripheral optic neuron. A destructive lesion of the visual area in the occipital lobe also caused degeneration, not only of tracts corresponding to the optic radiations in the cerebral white matter, but also in the lateral geniculate body. These are pathological demonstrations of the individuality of separate nerve cells or neurons. Beyond the elements of the nerve tract corresponding to single nerve units, atrophy or shrinkage also takes place, but the process is different from that which is observed in the tract in which the lesion occurs. It is a wasting mainly from disuse, rather than a degeneration of a trophic character. He also called attention to the fact that when a nerve fibre is injured or separated, in addition to Wallerian degeneration of its distal portion, a slower process of degeneration of the proximal portion also occurs. Dr. Adolf Meyer calls attention to the fact that Sir W. R. Gowers, even prior to the first paper of Forel on the investigations of Golgi, in his Manual of Diseases of the Nervous System, 1886, anticipated in large part at least the neuron theory. "The description of the pyramidal tract and its connection with the anterior horn cell is presented both in the text and in the drawing exactly as we would do to-day. He speaks of the pyramidal cell, its nerve fibre and the terminal ramification of the latter in the spongy substance of the anterior horn, and of the anterior horn cell, the fibre proceeding from it, passing through the anterior root and nerve trunk to the muscle, where it divides and ramifies on the muscular fibre." His, by his embryological studies did much to establish the anatomical independence of the neuron. As he found that in embryonal life the nerve cells originated from the germinal tube absolutely independently of each other, he reasoned that anastomosis between or among the nervous elements of the adult was altogether improbable. He was the first to demonstrate that every nerve process arose from a single nerve cell. He showed that the motor nerves originate from processes of cells both of the brain and spinal cord. He showed also that cells of the dorsal spinal ganglia at first have no processes; later they become bipolar, their two processes being fibrillated. The motor cells and their processes

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also showed fibrillation. Many other important conclusions were reached by His, all tending to the confirmation of the neuron doctrine as it is now commonly held. His findings regarding the fibrillation both of motor and sensory cells are of special interest in connection with the neurofibrillary theory of neural energy and neural conduction. Nansen, almost contemporaneously with Forel and His, published a valuable paper on the minute structure of the nervous system, in which, among other things, he contended that the axis cylinder processes were made up of minute tubules. He emphasized the great importance of the method of Golgi, and demonstrated the manner in which nerve processes branched and subdivided, his contributions being of distinct value in advancing the neuron theory as a whole. In 1891 Waldeyer coined the word neuron to represent all parts of the nerve cell—cell body, dendrites, .axon, collaterals and terminals of both axons and dentrites—this nerve cell and its processes representing a biological unit. He held that the entire nervous system was composed largely of innumerable units of this sort. From this time the word neuron and the neuron doctrine took deep root in neurological literature. The greatest exponent and defendant of the neuron concept is Ramon y Cajal, a Spanish histologist and former pupil of Golgi. He has excelled his master in the extent and perfection of his methods of using the Golgi stain. More than any other worker in this field, he has also sought for new truths in almost every portion of the central nervous system. From the brain cortex to the lowest segment of the cord; in the cerebellum, oblongata and midbrain; and in the system of gangliated nerves. His work has chiefly been done on embryos, especially those of the chick and of rodents. Among the most important conclusions of Cajal are the following: Each neuron is absolutely independent; anastomosis of nerve elements never takes place; the networks of Gerlach and of Golgi have no existence in fact; every portion of the neuron, and the neuron as a whole, are concerned both in conduction and in nutrition; nerve cells are not continuous one with another, but are in contact with their processes and terminals, the impulse passing from one neuron to another by a species of induction. He held also that the functions of nerve cells could not be determined by structural peculiarities, applying this conclusion especially to a refutation of the propriety of Golgi's subdivision of nerve cells into the motor and sensory. Space will not permit reference in a brief sketch of this character to all, or even to a majority of those who have made contributions of real importance to the development of the neuron doc-

trine.   Since the publications of Cajal in 1893 articles embodying origi-
nal research have been almost continuously appearing, especially in
continental Europe, but omitting a consideration of many of these,
our historical summary will be closed by reference to those who have
contributed most to the neurofibrillary theory which is now seeking a
firm foothold.

From Apáthy, a well-known Italian morphologist, the neurofibrillary
doctrine has received its greatest impetus, and his researches have ini-
tiated an era of doubt as to the sufficiency of the neuron doctrine.
Although he had labored for many years, first for an improved method
of bringing into view the finest structures of the nervous system, and
later in the use of this method, the results of his investigations were
not given to the world until 1897.   These results and the views an-
tagonistic to the neuron doctrine which necessarily grew out of them,
at once attracted widespread attention and led to new researches in
the same line.   It is necessary, however, before referring in more
detail to the work of Apáthy to glance at what was known of the fibril-
lary structure of nerve cells before his time.   Max Schultze, about
1871, emphatically asserted the existence of fibrils not only within
axons, but also in the cell body and all the processes of nerve cells.
One of the best illustrations of his views was that afforded by the elec-
trical organ of the torpedo, now much used in monographs and trea-
tises on this subject.   He did not believe that the fibrils which he de-
scribed with much clearness originated in the body of the cell, but
traversed and underwent a special arrangement in it, a view in this
particular strongly like that of Apáthy and his disciples.   It would
almost seem as if Schultze, considering the technique which he used,
had some extraordinary personal advantages, both in perception and
apperception, as some astronomers are known to be able with the same
telescope and under the same conditions to unveil deeper mysteries
of the heavens than others, or as the eye of the Indian sees and inter-
prets impressions and disturbances which escape the eyes of others.
Remak, Deiters, Koelliker and others had previously made observations
upon the structure of cells and their axis cylinder processes, but not
with the definiteness of Max Schultze.   The fibrillary structure of
axons and to some extent the cell body, and even the dendrites was
indeed largely recognized before the observations of Apáthy, but
doubts and difficulties were more numerous than clear ideas as to the
meaning or even as to the exact position, course and interrelations of
these fibrils.   It is well known that Nansen held, and probably still

holds to the view that the axis cylinder is composed of fibrillary tubules, and that conduction resides alone in this process or its constituents, regarding the cell body and its dendrites as entirely nutritional or trophic. Apáthy's studies were chiefly on the leech and earth worm, but he extended his investigations to other invertebrates, and even to some vertebrates, as to the rabbit and the ox. Apáthy distinguishes between nerve and ganglon cell as follows: The nerve cell is the producer of the neurofibrils, and hence the producer of that which conducts; while the ganglion cell produces that (force) which is to be conducted. These two forms of cells are believed to differ both histogenetically and histologically, but it must be confessed that a study both of Apáthy's paper and of the contributions of those who have presented his views, does not make clear just how the nerve cell differs from the ganglion cell in size and appearance. Is the fibril-producing nerve cell of Apáthy a variety of the ordinary ganglion cell; is it the well-known neuroglia cell; or is it a cell as yet undescribed because its appearance, position and exact interrelations are not yet really known, but are the subject of speculation only? These queries do not seem to find an answer, except in general statements, as to the existence of two classes of cells, ganglion cells and nerve cells. It is true that Apáthy asserts that his neurofibrils are produced both by nerve cells and neuroglia cells, which indicates that he believes in a distinct class of nerve cells. It may be that the final evidence as to the part played by neuroglia cells is not yet before us; in other words, that newer and still finer methods of technique may show the genetic relation between the glia cells and the neurofibrils. Apáthy's staining methods show a distinction between neurofibrils, the processes of glia cells, and true connective tissue. The neurofibril of Apáthy is not an ultimate structure, but consists of a bundle of still finer fibrils, which are spoken of as primitive or elementary fibrils. The neurofibril in its course from time to time gives off primitive fibrils, until at the end of its journey it may have only a single central fibril remaining. Two, several or many cells may be united in various ways by the neurofibrils; from cell body to cell body; through processes both dendrites and their axons and branches; or even by juxtaposition.

Apáthy divides the ganglion cells of his classification into a large and a small variety, each of these having its own peculiarities, especially as regards the method of entrance into the cell body, intracellular arrangement and course, and method of exit. In the large gan-

glion cells a neurofibril enters by way of the pyriform process, and breaks up into fibrillæ, which take a wide sweep and pass out by way of the pyriform process, and therefore in juxtaposition to the entering fibril.   In the small ganglion cells neurofibrils enter by way of the pyriform process in which they are placed peripherally, form plexuses, and have a somewhat complicated course and arrangement in the subdivisions of the cell body, and eventually converging, pass out as single fibrils of considerable size, in the centre of the pyriform process. The entering neurofibrils are cellulipetal or sensory in function, those passing out cellulifugal or motor in function.   Other cells of the leech described by Apáthy have axons and dendrites much like those usually described, and in their case the neurofibrils enter by way of the dendrites and pass out by way of the axons.   I cannot here give the exact manner in which the ganglion cell is subdivided into zones, and in which the neurofibrils enter the cell body, traverse in complex spirals and bundles, its zones, and emerge by way of its processes.   Neurofibrils have been traced into sensory cells and muscle cells.   Just as they enter and traverse ganglion cells, and do not terminate in them, so they pass into and through the peripheral muscle and sense cells.   In some cases also in analogy with their method of conducting themselves centrally, the neurofibrils are arranged into an intercellular lattice-work.   While very much has been done in the way of minute observation, it is still clear that the place of origin of these neurofibrils is not yet definitely determined.

Bèthe, a student of Apáthy at Naples, has beautifully demonstrated the existence of neurofibrils in a series of studies on a species of crab with methods designed or improved by himself.   According to him, while the neurofibrils may enter the cell body, the sensory and motor fibrils mix and anastomose in such a way that it may be impossible to say where one ends and the other begins.   Sometimes a sensory neurofibril enters by one protoplasmic process and passes out by another.   By means of these neurofibrils, according to Bèthe, all the nerve cells are in direct continuity, a proposition which is distinctly antagonistic to the theory of the neuron as a separate unit.   Bèthe worked with a special fibril stain.   In his study of vertebrates, observing the well-known bifurcation of fibres of the dorsal root, he noted that some of the contained fibrils passed into one bifurcation and some into another.   His most important conclusions as to neurofibrils in vertebrates were that fibrils were present in the protoplasmic processes of dendrites, as well as in the axons; and that the intracellular net-

works described and pictured by Apáthy in invertebrates are probably not present in vertebrates.   It is worthy of note that he spoke of the neurofibrils as only not probable in the cell bodies of vertebrates.   The acceptation of the neuron theory as a whole must, of course, eventually be based upon vertebrate as well as invertebrate studies.   He was not able to trace the fibrils, either to their origin or certainly even to their final distribution, but he endows them with conducting power.   In studying the nervous system of the crab, Bèthe found that the motor cells of the ganglia or "collections of cells" are situated in the periphery of the cell group, and each of these large cells sends its process to the centre of the ganglionic mass where the process splits up into a number of fibrils which pass out with the nerve into the muscle.   In the centre of the ganglion is an intricate network of neurofibrils, made up apparently of both sensory and motor elements, these constituting a sort of neuropile.   He isolated the cell bodies of the motor cells in the periphery of the ganglion.   After the first effects of the operation were over the crab could move the antennæ and reflexes resulted as usual, no change apparently having occurred except a slight exaggeration of reflex-irritability.   Later the antennæ slowly became paralyzed.   When the motor nerve to the antennæ was cut complete paralysis immediately resulted.   The neuropile in the centre of the ganglion was not affected by the operation which cut out the motor cell.   Bèthe argued from his experiment that the cell body was trophic in function, although perhaps it might also act as a bearer of reflex inhibition.   As above stated, he regarded the fibrils as the seat of neural energy.

Meyer makes the following reasonable criticism on the conclusion of Bèthe from the latter's antennæ experiments.   "A 'nerve cell' of an arthropod after Bèthe's nomenclature is only a very small part of a 'nerve cell' in the modern sense of the word neurone; the size of the processes of those small cell-bodies is such as to warrant the viability of the tissue for a period of two or three days, just as we know that a pheripheral nerve in man, when cut through, preserves its electrical excitability for at least two days, during which period the excitability both to the faradic and to the galvanic current may even be slightly increased (similar to what is mentioned in the experiment on the arthropod) ; then begins a gradual diminution and only at the end of the first week, or even as late as the middle of the second, do we find the minimum excitability.   With perfect knowledge of this fact, we maintain what we said concerning the 'motor neurone,' and the

only consequence of Bèthe's experiment on our general view would be this; and if we could destroy the nucleus of the segmental neurones without injuring the rest of the cell, the function of the cell would probably last at least as long as the excitability of a cut nerve. Between this and the extermination of the 'neurone theory' there is a long distance."

Becker, as recorded by Nissl, has succeeded in showing the presence of fibrils in the motor cells by a method of staining of his own, which had not been published at the time that Nissl recorded Becker's observation. The fibrils delineated by him pass through both the cell body and processes in small bundles. Within the corpus of the cell they take apparently complicated courses, circling around the nucleus. The fibrils entering by one process sometimes leave by the process immediately adjoining, not traversing the body of the cell. The fibrils as observed by Becker did not enter the nucleus. This question of the penetration of the nucleus by fibrils is one of great importance, and when decided will be an additional step toward the solution of the problems both of trophism and of special neural energy. A few observations by special methods have seemed to show that fibrils do sometimes penetrate the nucleus, but these conclusions have been challenged and as yet are not certainly demonstrated. The results above given regarding neurofibrils are the most important up to the year 1900. During the last few years a number of investigations have been undertaken with the view of their confirming or their overthrowing the observations and conclusions of Apáthy and his disciples, but up to the present the verdict must be not proved, with the balance of probabilities in favor of the acceptance of neurofibrils and of a neuro-fibrillary theory of the conduction and accumulation of nerve energy.

I shall next discuss a few points of interest in connection with the physiology of the nerve cell, including some consideration of the functions of its several parts.

With our present knowledge it would certainly seem that the nucleus with its nucleolus is the soul of the neuron. Its destruction is followed by the death of the cell and its processes, and its displacement leads to disturbance and disorganization in function. The nucleus and nucleolus may be the central termini of the primitive fibrils which surround it within the cell and surround the cell itself in the intracellular spaces. So far nearly all observations seem to show that neither the neurofibril as a whole nor primitive fibrils enter the nucleus, but in a few recorded cases the fibrils have apparently been seen entering both

the nucleus and the nucleolus. It has been suggested that the appearances which indicate this entrance of fibrils into the nucleus and nucleolus are artefacts, but it may be, as has often been the case before, that the artefacts of to-day are true evidences of structure to-morrow.

The neurofibrillary theory, as here expressed does not necessitate the abandonment of the neuron theory, but it must lead to a change of position in several particulars. It has been shown that the same neurofibril traverses the cell bodies of different ganglion cells; that it may take various directions among the cells; that it may pass in and out by dendrites or in and out by axons, or inward by dentrites and outward by axons. In other words, ganglion cells, the independent anatomical units called neurons, are structurally linked or welded together by means of these neurofibrils. One of the purposes of these fibrils would seem to be that of uniting, for nutrition and function, the separate neurons or nerve cells. Whatever may have been thought of a nerve cell from the anatomical point of view, in the physiological sense —as function is known to us—no neuron ever acts alone. What muscle contracts as the result of the impulse projected from and by a single nerve cell? What sensation is experienced as the result of the response of a single sensory cell? Still further, what reflex act is performed as the result of the incitement of a single nerve cell? Nerve cells act in groups for the purposes of the body. It may be that neurons arranged in a chain or series are in the accepted sense only in contact by their distal and central, that is, cellular processes, but that the neurofibrillary arrangement is necessary for the holding together of neurons in groups. The neuron group or, better, the neurononeurofibrillary group, which has a definite functional purpose, is the true anatomical and physiological unit. The facts which have been determined regarding the manner in which neurofibrils terminate in muscles and sense organs are not necessarily contradictory to this concept. These at the most demonstrate the manner in which the most peripheral neuron systems terminate. So far as I know no facts are yet forthcoming as to the manner in which junction is made between the neurons arranged in series, except perhaps the observations of Held as to the concresence of neurons in special cases in the adult.

What then was the function of the neuron as commonly accepted before the investigations of Apáthy and his followers—of the neuron less its intracellular and intercellular networks? Its function was chiefly trophic, and it may also have had a special kinetic function as suggested by Marinesco in his idea that the chromophilic substance

constitutes a form of kinetoplasm or energy-creating or at least energy-augmenting material, the framework of the processes being an inclosing and protecting sheath for the fibrils which wend their way within these encasements. Each separate cell in a sense may be comparable to an induction apparatus, including both the cell and the coils. The chromophilic substance of the cell probably corresponds in this analogy to the solution or substance which is the source of chemical action in the wet or dry battery.

Neural energy is correlated with other forms of energy as electricity, light and heat. No greater reason exists for regarding nervous energy as unrelated to the accepted physical forms of energy than for regarding these as absolutely independent of each other. That which is called life is present in animal and plant structures, but it does not follow that the forces at work in living organisms are in their ultimate nature absolutely different from the forces in nature at large.

Stimuli are received by sensory peripheral end organs which have the power of differentiating them. The nervous impulse or wave started by the stimulus is transmitted by or along neural conductors. In the course of development these neural structures at certain levels and in certain places take on special arrangements whose purpose is to transmute and differentiate stimuli. These stimuli are in some cases transmitted outwards after having undergone slight internal elaboration or differentiation. In other cases the differentiation is extreme and is expressed physiologically by highly specialized functions. In every case the functions are conditioned by a special anatomical structure.

All that goes to supply the nervous system with its necessary energy is received from without from what is taken in as food, using this word in its broadest sense. The nervous system is an apparatus for the reception of external stimuli and for the transmission and differentiation of nervous impulses and for the distribution of nervous energy. The structure which will best serve for the conduction, differentiation and distribution of impulses and the utilization of energy is one which offers the least resistance with the greatest economy of material, which would therefore be represented by matter drawn out into its finest strands, in other words, by the finest fibrils found in nervous tissue. Neurofibrils, including their primitive fibrils not only conduct, but, by means of special arrangements, decide the intensity of the discharge which they receive. In the spinal ganglia, as has always been shown, they form a sort of neuropile outside of the cell bodies, and Bethe

seems to have demonstrated that a reflex act can take place through this coil of fibrils without the interposition of the cell bodies.

It is significant that these neurofibrils are arranged within the cell bodies in the form of coils or spirals, sometimes being concentrically placed to each other. The arrangement of the intercellular fibrils has not yet been unraveled, but these also seem to show some tendency to arrangement in coils or spirals. Does not this method of arrangement give a hint as to function? It is not improbable that the special manner in which these fibrils are arranged is for the purpose of intensifying the impulse, which is passing through the separate strands which compose the coil or bundle. Looking at the subject in this way, the fibrillary coils and bundles represent a species of complicated induction coil. Induction probably takes place from coil to coil, and it may even be that we may eventually go further and make the nucleus with its nucleolus the analogue of the magnetic core of the induction apparatus. This theory would make all energy reside in the fibril, and of course in the neurofibrils and fibres which are made up of the elementary structures. The specific nervous energy therefore has its dwelling place, as has long been believed by most thinkers on the subject, partly within the cell, and also, as held by Nissl, in part in fibrillary structures outside of the cell, the intracellular and intercellular fibrils being indeed parts of one whole.

Neurons designed to elicit responses of a particular kind seek out in passing from chain to chain, from group to group or from individual neuron to individual neuron the dendrites of those particular nerve cells which eventually evoke the action that the external or at least initiatory impulse is destined to call forth. In other words, groups and systems of neurons have been so placed and related to each other in the process of development of the nervous system of the individual and of the race, that in the normal animal each neuron has its elected and most appropriate position. Wolfstein puts this aspect of the subject forcibly: "Through heredity, habit or specialization, a certain kind of external sensory impression will, upon arriving at the centres, find there the appropriate neurons which are endowed with the capacity to receive and conduct further such impression, e. g., an external excitation destined to elicit a muscular contraction, glandular secretion, vascular contraction. This idea has also been advanced by Lenhossek. In other words, with advancing growth of the individual and increasing complexity of nerve functions, we can well imagine that particular cells become susceptible to a particular influence only, so that an impulse

coming from without would wend its way through the thick forest of dendrids with perfect ease, sure to find ᴧ safe exit along the dendrids of that particular neuron for which it was intended, and avoiding every other." (Wolfstein.)

The process of physiological and anatomical selection almost necessitates the setting apart and arrangement of the neuronal systems in the central nervous system. For economy of space and for other adaptations the neurons destined to evoke special responses—visual, auditory, tactile, thermic, motor and the like—would concentrate their endings or beginnings in certain centres or zones. The investigation of the neuron, instead of destroying the doctrine of localization, emphasizes its value and importance, but it requires of the student of the subject the recognition of new points of view or of departure. A fact established can never cease to be a fact; it is an addition to the general sum of truth. In the light of subsequent discoveries it may, however, be necessary to look at the first facts from a different point of view, or, at least, to interpret them in other terms. The doctrine of localization, like that of the neuron, cannot be overthrown; even the "centre" of the localizationist, if it is a centre which has been authenticated by proper inductions—by experiment and clinicopathological observation, must remain a centre of function, disturbances of its function continuing to be a guide to the physician and surgeon. To know that all the cells of one portion of the cerebellum send their axons to another, or, indeed, that the cells of any one portion of the nervous system are connected by axons, collaterals and terminals with the cells of another through their dendrites or cell bodies does not invalidate the theory of anatomical and functional localization, although this knowledge may give us a deeper insight into interrelations. It enables us to better picture mentally the manner in which the anatomical connection and functional interrelation are consummated. It does perhaps lead us to direct out attention a little more to neural mechanisms as has been suggested (Meyer), but it must not be forgotten that the attention of the thoughtful neurologist, even of the extreme localizationist, has always been more or less fixed upon such mechanisms, as is indicated for instance by current views regarding the cerebral mechanism of speech. With the neuron theory before us, what is necessary for us to do is to explain the old facts in the light of the new, to modify our concepts of the mechanisms or processes. If it remains as the author believes that destruction of the postcentral convolution of a certain portion of the limbic lobe will cause impairment or loss of cutane-

ous sensibility, destruction of the superior parietal convolution, impairment or loss of the stereognostic sense, and destruction of the true motor region, impairment or loss of motion, it becomes our duty to explain by every newly acquired fact and theory how this is brought about. It is here probable that Ramon y Cajal's doctrine of the dynamic polarity of the neuron has a part to play, as has also the view that in the body of the nerve cell and around it neural energy is more or less concentrated. An acceptance of these views makes clear the old idea of centres in their relation to cortical gray matter. The axons, collaterals and terminals are largely conductors or transmitters of stored or concentrated neural energy, this storage or concentration taking place within and between the cell bodies through the intermediation of the neurofibrillary piles or condensers after the manner indicated as probable in preceding paragraphs. The energy is polarized in and around the cell bodies by a species of induction from one coil or set of neurofibrils to another. The centralization of neuronal energy takes place in the neurofibrillary coils and plexuses, intracellular and intercellular. The transference of this energy from one neuron or system of neurons to another is brought about through the processes and their collaterals and terminals. Destruction of a collection of cell bodies and of intercellular neurofibrils will cause a greater reduction of that form of specialized neural energy which has its localization (centralization) in the particular region destroyed than will destruction of the processes which convey to it the stimuli which call this energy into activity. Centres of functions are still to be relegated to the brain cortex and to other regions where gray matter is accumulated. Lesions of centres continue to be explicable. Nerve fibres continue to be recognized as conductors, and lesions of these conducting fibres, while they continue to give disturbances (symptoms and signs) similar to those caused by lesions of centres do not give them in the same degree or even always of the same character as lesions of the centres themselves. A lesion confined to the stereognostic centre will give astereognosis as a dominating symptom because that form of neural energy which has its outward expression in stereognosis has its localization or centralization in the intracellular and intercellular neurofibrillary coils and plexuses of the region assigned to this sense. Lesions of the processes which transmit the assembled and rearranged sensations designated as the stereognostic sense to the centres of the motor region will also give some degree of astereognosis, but in receding amount according to the distance

of the axonal lesion from the stereognostic centres. A lesion of one centre must always cause some disturbance in other centres correlated with it, but the degree and quality of this disturbance will vary greatly according to distance, and also according to the degree of interdependence in function of the centres in question.

The vexed question of separate cortical areas of representation of the different forms of common sensibility (including besides cutaneous sensibility, muscular and the stereognostic sense) and of motion must receive elucidation from the neuronal basis. The question simply changes from such forms of interrogation as, Have we in the cerebral cortex special areas for the representation of touch, pain, temperature, the muscular and stereognostic sense, and separate motor areas? to the form, Have we in the cerebrum separate neuronal systems representing the functions indicated? It is the author's belief that such separate systems exist, the functions pertaining to these symptoms being centralized or at least polarized at the perikaryonal ends of the neurons concerned. Embryological and pathological investigations he believes support this view, which is a priori probable. The results of embryological studies in myelinization by Flechsig and others are not in antagonism with the view that there are separate areas of representation for sensation, movements, and for the assembling processes which intervene between sensation and movements, although some of these may appear at first sight to be opposed to this view. Flechsig traces the upward continuations of neuron systems both of the lemniscus and the red nucleus, although he does not discriminate between these two sets of fibres in his descriptions. He divides all the central centripetal neurons after they have reached the level of the red nucleus and internal capsule into three systems of fibres which become medullated at different ages and can therefore be distinctly separated from each other. The first of these systems is medullated at about the ninth fetal month, occupies the most posterior part of the internal capsule, and in its upper half the area immediately behind the pyramidal tract. Its fibres, coming in part from the median lemniscus, are distributed according to Flechsig, exclusively to the cortex of the two central convolutions. The fibres of the second system, which come entirely from the thalamus and chiefly from its lateral nucleus, become myelinated one month later than those of the first system, and while one portion of this system passes to the convolutions included by me in the motor zone, the main body of the fibres is distributed in three separate bundles to the gyrus fornicatus, hippocampal convolution and uncinate

convolution, in brief, to the entire limbic lobe. A third system, which is medullated still later, emerges from the anterior portion of the lateral nucleus of the thalamus, passes into the internal capsule about its middle portion, then, subdividing, is eventually distributed by more or less separate bundles to the third frontal convolution, the middle portion of the gyrus fornicatus, the anterior portion of the superior or first frontal convolution, and the foot of the middle or second frontal convolution. It is altogether probable that the fibres of those systems which are distributed to the limbic lobe are concerned with the transmission of sensations which have their cortical termini in this lobe. Those fibres which go directly to the convolutions of the motor region are concerned with the more direct cerebral reflexes. The views here presented with regard to the sensorimotor mechanism accord in the main with the ideas involved in Flechsig's theory of association centres. The superior and inferior parietal convolutions and the precuneus form an important portion of his associative system, and in these convolutions the clinical facts here presented would seem to indicate that the associative and stereognostic centres are situated. A little consideration will make it evident that the facts of clinical medicine are in accord with those of embryological research. The muscular sense and especially the stereognostic sense, as it is now understood, are higher developments than the sense of touch, pain and temperature. Flechsig has shown that the white matter in the superior and inferior parietal lobules, like that of his other association regions, becomes medullated considerably later than that of the sense centres, those in the limbic lobe, for instance. These association centres furnish a mechanism which makes possible "the working up into higher units of simple sense impressions and of combinations of simple sense impressions of the same qualities and of different qualities" (Barker). In this connection I wish by reiteration to make my position entirely clear. I believe that the centres both for the more simple forms of sensibility, like those of touch, pain and temperature; and the centres for such higher processes as stereognosis, are entirely distinct from the motor centres proper.

Donaldson in a valuable paper has contributed to our knowledge of the size and shape of the neuron. The observations were made on the growing nerve cells of the white rat. In the lumbar spinal ganglion the increase in volume of the largest cell bodies was shown to be closely correlated with the increase in the cross section of the growing nerve fibre. His studies also show that the area of the axis cylinder was

almost exactly equal to that of the surrounding medullary sheath. He showed by the data of comparative anatomy that the length of the nerve fibre was not correlated with the volume of the cell body, "the increased length of the fibre not putting a direct nutritional tax on the cell body itself." Donaldson in his contribution cited some investigations of Dr. Elizabeth Dunn, which showed that the commonly accepted view that the fibres of largest diameter had the longest course was not always correct. In the case of the nerve fibres supplying the thigh of the frog, it was demonstrated that the average diameter of the fibres supplying the thigh was greater than that of the fibres which passed beyond the knee to innervate the remainder of the leg. The largest fibres of the nerve were found in the branches going to the thigh. A most important part of his contribution, and one which seems to me to have some bearing upon the theory of neurofibrils and primitive or elementary fibrils composing the neurofibrils is contained in an effort made to interpret the calibre of the nerve fibre and the significance of varying calibre. Fibres of large calibre were shown to have an extensive terminal distribution. "Where the nerve elements (fibres) were few in number as compared with the mass of skin or muscle to be supplied, this indicated a coarse innervation. If, however, the number as well as the size of nerve elements was large, a very fine degree of innervation might result, as in the case of the extrinsic muscle of the eye." (Donaldson.)

These observations of Donaldson have a direct bearing on the neurononeuro fibrillary theory as held by the writer. I believe that the axon, with its terminal arborizations and its collaterals and their terminations, represents the method in which bundles of neurofibrils and their constituent primitive fibrils are distributed. Each neurofibril goes to one of the relatively large collaterals, or to one of the trunkal branches of the terminal arborizations. This neurofibril, as already shown, is merely a cable composed of primitive fibrils, each of which goes to a terminal branch of a collateral or of the axon's terminal tuft.

A CASE OF MULTIPLE CEREBRO-SPINAL SCLEROSIS, WITH REMARKS UPON THE PATHOGENESIS OF THE AFFECTION.

By F. X. DERCUM, M. D., and ALFRED GORDON, M. D.

The concensus of opinion regarding the frequency of multiple sclerosis is that it is a rare affection in this country. This view is based upon the fact that typical cases presenting the classical symptoms are comparatively few. We should not, however, forget that in its early stages and in certain cases, even in the latest stages, diagnosis of the affection is exceedingly difficult; perhaps, therefore, the disease is less frequently recognized than we would expect. Charcot had long ago pointed out the polymorphous character of this curious disease and the erroneous diagnosis made in many cases. Recently Hoffman (Deutsche Zeitschr. f. Nerv., 1902) has expressed the same view. Indeed, he maintains that the affection is one of the most common of organic nervous diseases. Being clinically often difficult of recognition, the thought arises whether the low percentage of cases in this country, as compared with Europe, may not in part be due to the small number of necropsies reported. In fact, as far as we know, only six cases with pathological findings have been reported in the United States. Two by Spiller, two by Spiller and Camp, one by Burr and McCarthy and one by Hunt. The following case is, therefore, the seventh.

L. C.; female; aet 29; white; entered the Philadelphia Hospital August 26, 1903, with the following history: Complaining of pain and tenderness in the pelvic region and profuse leucorrhoea. She was admitted to the gynecological wards. She had menstruated at twelve and had married at seventeen. She had never had living children, but three miscarriages. Three years previous to admission, she fell and struck on the buttocks; since then the nervous disturbances enumerated below gradually developed. An operation showed cystic ovaries of long standing. Oophorectomy was performed. Later she was transferred to the Nervous Wards, where the following symptoms were elicited: The body was much emaciated and distinct atrophy of individual groups of muscles, especially those of the thenar and hypothenar, were noted. There

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was complete loss of power in the lower extremities. She could not flex or extend her legs. There was double foot-drop; the left foot was rotated inward. The knee jerk was increased on both sides; ankle clonus existed on the right; Babinski was present on both sides. Examination for sensation showed a hyperalgesia of the whole body. The patient complained also of considerable pain in the joints, especially in those of the shoulders and hips.

There was a very coarse intention tremor, more marked on the right than on the left. The speech was distinctly scanning. Lateral nystagmus was present in both eyes. The pupils were unequal, the right larger than the left; they responded to accommodation, but very little, if any, to light. The left eye showed slight ptosis. Ophthalmoscopically the eyes were not examined. There was incontinence of feces and urine. A large bedsore was present over the sacrum. Gradually the knee jerks began to disappear; at first on one side, and then on the other. When shortly before death she developed a profuse diarrhea, the knee jerks were entirely gone. She died October 2, 1903.

The autopsy showed: Hypostatic congestion of the lungs, chronic parenchymatous nephritis, pyelonephritis, cystitis and colitis. The brain was deeply injected; the pia-arachnoid slightly edematous. Beneath the tentorium there was a large amount of clear straw-colored fluid. The dura of the spinal cord was distended likewise with a straw-colored fluid.

Microscopical examination of the brain, cord and peripheral nerves.

CORD. CERVICAL PORTION. (Weigert and Weigert-Pal methods). Transverse sections reveal great areas of sclerosis involving extensive destruction of the nervous tissue. From above downward the anterior cornua have gradually disappeared. In the upper levels the most anterior portions only are preserved, while in the lower cervical segments they are entirely absent. In the white substance the sclerotic areas also have entailed extensive destruction and some degeneration of fibres. In the upper segments, the anterior white columns are intact, but as we descend to the thoracic portion they become gradually reduced. The lateral columns and the posterior columns of the cord, on the contrary, are almost entirely absent in the upper levels, but are preserved to some extent in the lower levels. A small band of healthy fibres is seen at the periphery of the cord surrounding the sclerotic areas. It is to be noted that healthy fibres are everywhere intermingled with the degenerated ones. The degeneration as well as the sclerotic areas are not symmetrical nor equal in extent in the two halves of the cord. The posterior roots show distinct degeneration at the level of their entrance into the cord, but only on one side. The anterior roots also show some degeneration in the lower cervical portion. The blood vessels around the cord show distinct dilation with thrombotic foci and in some places present signs of endo and periarteritis. Marchi's method shows clearly very marked recent degeneration in areas which are apparently normal with Weigert's stain.

THORACIC REGION. As in the cervical cord, there is extensive discoloration of the gray matter. In a small portion only of the thoracic cord are parts of the anterior cornua preserved; all the rest of the gray matter is destroyed. The anterior white columns as in the cervical cord are intact. The reduction of the anterolateral columns continues down the dorsal cord, so that we find

only a very small area preserved on one side and extensive degeneration on the other. The postero-lateral columns are totally destroyed with exception of a few fibres in the direct cerebellar tract on one side and an extremely narrow peripheral band on the other. The posterior columns are entirely destroyed on one side, while on the other they are reduced to a few fibres. The posterior roots are destroyed on one side and much degenerated on the other. The blood vessels are in the same condition as in the cervical region. Marchi's method shows recent degeneration in the pyramidal tract and in the posterior columns.

LUMBAR CORD. There is complete destruction of the anterior portion of the anterior cornua. The anterior white columns and antero-lateral ground bundle are destroyed in the upper portion, but only partly degenerated in the lower portion. The crossed pyramidal tracts show distinct degeneration through the entire lumbar segment. The posterior columns as well as the roots are normal. The blood vessels are unusually dilated and thickened, especially in the lower portion. Marchi's method shows recent degeneration in the anterior columns only in the upper cervical segment.

THE SACRAL CORD shows almost complete absence of gray matter, and the white substance contains only degenerated fibres. The roots are intact. The blood vessels show the same changes as in the other portions of the cord.

MEDULLA. In the lowest segment the nuclei of the columns of Goll and Burdach are totally destroyed; in the columns themselves there remain very few fibres; the rest are degenerated; the same condition is noted in the decussating fibres. At the level of the beginning sensory decussation there is seen the same destruction of the nuclei gracilis and cuneatus, areas of degeneration in the posterior columns and a marked sclerotic area in the sensory decussation. In sections above we see reappearance of a great many fibres in Goll's and Burdach's columns, but intermingled with a great many degenerated fibres, more upon one side than upon the other. The above mentioned nuclei, also Monakow's nucleus, are entirely absent. The destruction of the sensory decussation extends forward, but unequally, into the pyramids and involve also a large part of the nucleus of the hypoglossus. Very few cells are seen in the nuclei of the eleventh and twelfth nerves. In upper sections we see the sclerotic process involving also the gelatinous substance of Rolando, the fasciculus solitarius, the nuclei of the eleventh and twelfth nerves, the interolivary portion of the formatio reticularis alba and portions of the pyramids. These changes are not symmetrical.

In sections above the nuclei of Goll and Burdach reappear again, but unequally on both sides; the sclerotic process is seen to extend to the restiform bodies. Gradually in sections higher up, the nuclei and the columns of Goll and Burdach become more and more free from the sclerotic process and show only degeneration. The latter process involves also the cerebello-olivary fibres which surround the descending root of the fifth nerve. The pyramids also show only degenerated areas. In the sections following the nuclei of the eighth, ninth and tenth nerves also reveal partial destruction. Higher up we see also that the tuberculus acusticus, the two nuclei of the eighth, the solitary bundle, the olives with their afferent and efferent fibres, are more or less

and unequally on either side involved; the pyramids always show areas of degeneration. The posterior longitudinal bundle, the median fillet, the trapezoid body, the inferior cerebellar peduncles are also partly destroyed. Similar conterior longitudinal bundle are more or less degenerated. The optic tract in ditions are noted in the knee of the seventh, in the nucleus of the sixth, in the descending sensory root of the fifth; also in the posterior transverse fibres of the pons and in the pyramidal bundles. At the level of the cerebellum we see that the three cerebellar peduncles, both roots of the fifth nerve, the middle lobe of the cerebellum, besides the pyramidal bundle—all suffer considerably. At the level of the Aqueduct of Sylvius, the pathetic nerve is almost entirely destroyed on one side. In the subthalamic region one red nucleus and one posfront of the mamillary tubercles is totally degenerated on one side and slightly on the other. The foot of one cerebral peduncle is markedly degenerated in its inner third and the other in its middle third. A vertical section through the posterior limb of the internal capsule at the level of the posterior commissure and the pineal body shows an area of degeneration in the middle of the internal capsule; the degeneration involves also the fibres passing from the optic thalamus to the capsule and the posterior commissure itself. The degeneration is also seen to involve the fibres going from the thalamus to the cortex. Areas of degeneration are found besides in the white matter of the motor area of the brain and in the cerebellum. The blood vessels of the medulla show the same change as in the cord.

A review of the pathological findings shows that the condition of the gray matter is as follows: In the sacral portion of the cord it is totally absent, in the lumbar cord it is preserved, and again begins to disappear in the thoracic and cervical segments. As to the white substance, it is preserved to a great extent in the lower cord, but in the thoracic segments while it presents areas of degeneration, it contains also vast areas of total destruction, irregularly distributed. The height of the destruction is reached in the cervical cord. In taking up the individual tracts of the cord we see that the anterior and the antero-lateral columns are gradually reduced from above downwards. No such regularity could be traced in the posterior and postero-lateral columns. The irregularity of the sclerotic process is particularly marked in the medulla; while in one section the areas of destruction are multiple and extensive, in others there is merely a marked diminution. However, we can say that the gray matter, viz., the nuclei, suffer more than the fibres. Almost all of the nuclei of the cranial nerves and the nuclei of the medulla and pons are affected. The motor as well as the sensory decussation, various afferent and efferent fibres of the olives, the three pairs of cerebellar peduncles, the pyramidal bundles, the middle lobe of the cerebellum and the hemispheres of the latter, the geniculate bodies, the red nuclei, the posterior longitudinal bundles, the internal

capsule the thalamic fibres going to the internal capsules and to the cortex, finally the optic tracts—these are the structures affected by this curious disease process. The characteristic features consists in the remarkable irregularity of the distribution; the site and extent of the pathological areas vary from section to section and there is no symmetrical arrangement of the patches in the two halves of the sections. Marchi's method always showed recent degenerations among the preserved fibres. The blood vessels showed all along the cerebro-spinal axis—distinct and in some places marked dilation and thickening of their walls. Leucocytic infiltration of the walls of the blood vessels, also thickening of the meninges with nuclear infiltration are seen at the periphery and in the fissures of the cord.

The condition of the cells and of the axis cylinders deserve special mention. In contrast with the extensive foci of sclerosis in which the fibres of the white matter are entirely destroyed we found curiously enough marked preservation of a large number of cells; even in the midst of an entirely discolored portion showing total destruction of tissue. Thionin stain revealed some cells intact. It is true that in similar areas the majority of cells are absent, but it is certainly surprising to find normal cells in foci of such a character. A quite considerable number of normal cells are seen in areas where the nervous tissue if not entirely is at least to be a great extent damaged. A glance at these findings gives the impression that the destruction process had originally no predilection for the cells, which it as it were avoided and affected only the white substance. There are, however, some degenerated cells in which are to be seen the usual chromatolysis with displacement of the nuclei and deformities of the entire cell. Similar remarks can be made about the axis cylinder. Not only among the ordinary degenerated fibres, but also in the completely destroyed areas, axis-cylinders are seen to be present. Naked axis-cylinders are found scattered in the most diseased areas. Transverse sections, however, show that they are irregular in form, angular, large or unusually small (atrophies). That they are diseased, there cannot be any doubt, but the fact that they are present, without their medullary sheaths, even in dense islets and sometimes normal in shape and size—is strongly suggestive of the view that the sclerotic process has a tendency to affect primarily the medullary sheaths and spare for a long time the axis cylinders.

The pathogenesis of disseminated sclerosis is still a subject of discussion. According to the vascular theory, the destruction of nerve

tissue is secondary to a primary alteration of the vessel walls. Although in a number of cases endarteritis and periarteritis have been found in multiple sclerosis, some competent investigators have failed to find such lesions, or at least, changes that are characteristic and pronounced. Our case presents dilatation and thickening with leucocytic infiltration of the vessel walls, but these changes are not equally nor extensively distributed. Moreover, in certain regions, in which the destruction of nerve tissue is the least marked, the vessel-changes are the most pronounced, as for example in the lumbar segments of the cord. In other words, the degenerated condition of the vessels is not in keeping with the destructive process in the nerve tissue. It is very probable that these changes do not bear to each other the relation of cause and effect. Further it is not impossible that the same pathogenic agent (whatever it may be) affects both nervous and vascular tissues at the same time, though in varying degree. Eduard Mueller, who has recently made multiple cerebro-spinal sclerosis the subject of an exhaustive treatise, goes so far as to regard the vascular involvement as secondary to the involvement of other tissues.

Regarding the lesions themselves, it is noteworthy that the nervous elements proper—that is the axis cylinders and the nerve cells—suffer last and least. All observers agree in the frequency with which nerve cells and axis cylinders are found intact in the sclerosed areas. The myelin disappears long before the axis cylinder is destroyed. This doubtless accounts for the infrequency and merely occasional presence of secondary degeneration. Whatever the origin of the disease really is, it is not impossible that we have to deal here with a sclerosis of the neurogliar tissue. This position is strongly advocated by Mueller. In confirmation of this view, Mueller points to an instance observed by him in which multiple sclerosis and syringo-myelia coexisted in the same patient. He would indeed regard multiple cerebro-spinal sclerosis as a multiple gliosis of the nervous system. However, the rarity of the concurrence of syringo-myelia and multiple sclerosis would alone throw doubt upon this interpretation. Furthermore, gliomatous lesions of the nervous system observed elsewhere than in the cord are not in any sense comparable to typical plaques of sclerosis. Again, there are many facts which render a theory that this disease is dependent upon some abnormality of tissue development, embryonal or otherwise, untenable. That the lesion may have its origin in the glia, is not impossible. However, all that we have a right to infer is that neither the nerve cells or axis cylinders on the one hand nor the blood vessels on the other are primarily involved.

An interesting pathological feature of our case is found in the presence of secondary degeneration, which, as is well known, is a rare occurrence in multiple sclerosis. Beginning in the motor area and continuing through the internal capsule down to the medulla and the very lowest portion of the cord, we found in the pyramidal tract besides isolated sclerotic islets also degenerated fibres intermingled with normal ones. We are, however, unable to say whether this secondary degeneration is an independent condition or is in relation with the sclerotic foci.

Finally we wish to call attention to an interesting phenomenon observed during the patient's life, and which was of some diagnostic importance, viz., the condition of the knee-jerks. While at first they were exaggerated and remained as such for a long time, they gradually diminished in intensity and finally disappeared. This was an indication of an extension of the pathological process from the white matter to the gray. We consider this observation noteworthy as some competent authors (Maris and others) believe that the knee-jerks are never absent in disseminated sclerosis. As a last interesting feature of the case we wish to emphasize the involvement of the nuclei of the third, fourth and sixth nerves with their nuclei and also the optic tracts.

EXTIRPATION OF THE LACHRYMAL SAC, WITH CASES; MICROSCOPIC EXAMINATION OF THE EXCISED SACS.

By G. E. DE SCHWEINITZ, M. D.

Extirpation of the lachrymal sac is an old operation. It was recommended by Celsus that the sac should be removed down to the lachrymal bone, which was subsequently touched with the point of a glowing iron. The same method is recorded by Galen and by Paulus, of Aegina, both of whom declare that many surgeons in its performance bored through the os unguis into the nose. In the early portion of 1700 Platner described and commended the operation, also associated with perforation of the lachrymal bone; it is mentioned in the works of von Arlt (1855) and De Wecker (1865), and in a modified manner by Mooren. Berlin* from whose paper on this subject, presented to the Heidelberg Opthalmological Society in 1868, these historical data are quoted, gave the first impetus, in comparatively modern times, to this operation, which is now commonly and successfully practiced in many suitable cases.

A review of the comparatively recent literature of this subject will be found in an article by Toedten,† to which the reader is referred for the history of the operation and the various methods of performing it.

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* Monatsbl. f. Augenheilk., VI, 1868, p. 355.
† Zeitschr. f. Augenheilk., II, 1899, p. 567.

METHOD OF OPERATING.—A number of methods of exposing the sac have been proposed, those that are most familiar being the Voelker-Kuhnt procedure and the one designed by Axenfeld.‡ Other methods will be found in Czermak's work.

Kuhnt makes a 1½ cm. incision directly along the crista of the frontal process of the superior maxilla down to the bone. Next he cuts with the scissors the ligament at its insertion in the crista. Following this the capsule of the sac is opened at the anterior crista and the sac is brought to view.

Axenfeld calls his method the subperiosteal, which in many respects resembles the Kuhnt-Voelker's method, but differs from it in this respect, that the incision is placed anterior to the crista and the dissection is made subperiosteally, much aided by a special method of checking bleeding. The chief incision passes nasalward from the inner lid angle, beginning somewhat above the internal canthal ligament, about 2 to 3 mm. anterior to the crista lachrymalis, in a curved manner downward and outward in a length of about 2½ cm., directly to the bone, the periosteum of which is divided. After the incision a matter of first importance is to check the bleeding; otherwise it is difficult to recognize the structures. A Miller's wound-speculum, to which Axenfeld has added somewhat larger teeth, is utilized to draw the lips of the wound asunder in a horizontal direction. Next there is placed in position the speculum which Axenfeld has designed, by means of which the upper and lower angles of the wound are drawn apart, the pressure at the same time causing a checking of their freely bleeding margins. With a suitable instrument the periosteum is detached from the crista down to the fossa lachrymalis, the blade of the instrument being so passed that it goes posteriorly, and the nasal wall of the lachrymal sac, together with the greatest portion of the posterior part, is freed to the naso-lachrymal duct. By this method one is able to remove the sac *in toto* much better than if an attempt to remove it

‡Klin. Monstabl. f. Augenheilk., XLI, Bd. I, p. 134.

without the subperiosteal procedure is undertaken. Next, the upper portion (including the capsule), is seized with the pincers, loosened and divided from its attachment with a small scissors. Finally, the remaining attachments are loosened down to the ductus, which must not be cut off until the dissection has proceeded well into the canal.

I have usually operated in the following manner: The skin being drawn toward the bridge of the nose, a slightly curved incision is made down to the periosteum, which extends from 4 mm. above the internal canthal ligament to 5 mm. below it, and passes along the orbital margin, the entire length of the cut being 2½ cm. If a rapid removal of the sac is necessitated the canthal ligament may be divided with scissors, and while the lips of the wound are separated, the temporal lip being especially drawn outward, the fibrous expansion from the tendo-oculi is divided through its whole length, exposing the sac, which usually can be recognized by its bluish color. The sac is next gradually separated from the periosteum, being dissected out very much in the manner of removing a cyst, care being taken not to rupture its walls. The internal surface, the upper end and the posterior surface of the sac having been freed, the tissue is cut through at the commencement of the nasal duct. Many operators do not believe it is necessary to divide the tendo-oculi in order to expose the sac, but that it can be dissected out from underneath the tendon. This I have succeeded in doing in the majority of cases. I have twice operated exactly as Axenfeld describes, but without his instruments.

After this dissection is completed, no matter what method is used, great care must be taken to notice that every portion of the sac is removed, and the operation should be terminated by thoroughly curetting the region and the ductus ad nasum, removing all traces of mucous membrane. Three sutures close the wound, which usually, and in my experience always, heals promptly. If the tendo-oculi has been severed it may be repaired by a strong suture, although I have not seen any evil consequences when this is omitted. Holmes advises that the canaliculi should be closed; otherwise a blind pocket forms at the inner canthus. They may be destroyed through their entire length by touching their lining membrane with the actual cautery. The dressing should consist of a pressure bandage placed over a light compress, and the stitches removed on the third or fourth day.

COMPLICATIONS.—(1) The most common complication, and the one that gives the greatest annoyance is hemorrhage. There is always considerable oozing from the severed tissues, and occasionally a very smart hemorrhage occurs, owing to division of the angular vein or the angular artery. If the vein is cut, pressure will readily stop it: if the artery the checking of the hemorrhage is much more difficult, and twice in my experience has been more than annoying. It can be controlled in the usual manner with a fine silk or cat-gut thread. Doubtless all of the difficulties of hemorrhage will be obviated by Axenfeld's clever device of two specula.

(2) There may be difficulty in finding the sac, especially if there has been much inflammatory action prior to the operation. Its position can always be ascertained by inserting a probe through the canaliculus. As this has proved unsatisfactory to some operators, it was suggested by Semon* to fill the sac with paraffine, a procedure which Dr. Todd† has again recently advocated. Holmes also suggested the injection of starch under pressure in order to bring about this desired result. I have never tried any of these procedures, nor have I ever seen a case in which I thought they were necessary.

(3) Keratitis occasionally follows the operation, but it must be exceedingly rare. Axenfeld saw it only twice in 270 extirpations, and one of these patients was a filthy man, who had, in addition, seborrhea of the beard and edges of the lid, while the other one had an ectatic leucoma adherens. I saw with Veasey a curious form of keratitis following extirpation of the lachrymal sac. In this case, however, the lachrymal gland had also been excised. The case has been fully reported by him.

By far the most serious complication with which I am acquainted is reported by Brandes.* In a boy, aged 11, purulent cellulitis of the orbit with retrobulbar neuritis leading to partial atrophy of the optic nerve followed the operation. The details are not given, and I have been unable to find the original report. Personally I have never seen any complication arise.

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* Klin. Monatsbl. f. Augenheilk., XL, 11, 1902, p. 176.

†Archives of Ophthalmology, XXIII, 1904, p. 373.

* Abstract Annals of Ophthalmology, XI, 1902, p. 105.

(4) Suppuration and reaccumulation of purulent material continue, in spite of the operation. This means that the extirpation has been an imperfect one. This complication has not occurred in my experience.

INDICATIONS.—In general terms it may be stated that extirpation of the lachrymal sac is indicated and practically always when properly performed yields good results in cases of chronic dacryocystitis. It may be employed if conservative and ordinary surgical measures have failed; if there is an impassable stricture; if an operation on the eyeball is speedily necessary; for example, the removal of cataract or the performance of iridectomy; if there is a serpiginous ulcer of the cornea, and in some cases of caries of the lachrymal bone. A very important indication is one insisted upon by Axenfeld, namely, suppurating dacryocystitis occuring in patients who are liable by virtue of their occupation to corneal injuries and therefore to corneal ulceration. It should be urged in elderly persons who cannot endure probing, and is useful in some cases of lachrymal fistula. Finally, I would point out that it is especially valuable in the insane, many of whom are the subjects of very stubborn types of chronic dacryocystitis.

RESULTS OF THE OPERATION.—As already stated, if the sac is removed entirely and no traces of the inflamed mucous membrane allowed to remain behind, and the ductus ad nasum thoroughly curetted, they are almost invariably good. There is some difference of opinion as to the amount of epiphora which remains afterward. Schirmer investigated 50 patients who had submitted to this operation from eight to two and one-half years after its performance, and found that in the majority of cases, although the eye did not weep within doors, if it was exposed to wind epiphora occurred, and makes the astonishing statement that only half of them asserted that the overflow of tears was better after than before the operation. The improvement does not, according to him, depend, as Tscherno-Schwartz believed, upon an atrophy of the lachrymal gland, as this has never been proved to be the case in human beings, but upon an improvement of the surrounding conjunctival conditions. If the epiphora persists after extirpation, it is due to a conjunctivitis or an ectropion. A continuation of tears after the operation results often from imperfection in the technique. Thus, if the cut is made too near to the inner canthus, there may be a dropping away of the angle from the lid, which causes an overflow of tears. Lundsgaard had the oportunity of examining a

lachrymal gland thirteen months after the patient had submitted to the operation of extirpation of the sac. No atrophy was found and no new canal had formed.

On the whole, it would seem, as Axenfeld has pointed out, that if the technique of this operation is correct, in the majority of cases after a week or two there is decided diminution in the secretion of tears, and sometimes the overflow or epiphora entirely ceases and the eye is dry, unless it is exposed to some decided irritant like cold or sharp wind. The adaptation is quicker in those patients who have prior to the operation had complete stenosis of the duct and in whom the overflow of tears has been particularly great. This, indeed, is the rule in many cases of chronic dacyocystitis. The removal of the lachrymal-sac secretion after extirpation depends largely on a lessening of the irritation to which the lachrymal gland has been subjected by the infectious secretion and catarrhal condition of the conjunctiva.

According to Axenfeld, that gradually an atrophy of the lachrymal gland develops during long-standing epiphora, as Stanculeanu and Theophari, and still later, Terson, have stated, is not proven. The degeneration which has been described by these authors is in all probability an error of observation. Axenfeld and Biettis have shown that in the physiological condition the epithelial cells of the lachrymal gland contain fat, and they have examined many extirpated tear glands without finding the slightest atrophy of their tissue. I also have investigated the histology of the lachrymal gland under these circumstances, and can confirm Axenfeld's statement in this respect. One year after the removal of the lachrymal sac a gland of this character did not show the slightest signs of atrophy.* If the epiphora after extirpation of the sac continues to the annoyance of the patient, it may be much relieved and materially lessened, sometimes, indeed, checked, by ablation of the palpebral portion of the lachrymal gland. In a certain number of instances it may be necessary to remove the entire lachrymal gland, a procedure which has been advocated by C. R. Holmes in this country.

PERSONAL EXPERIENCE.—The number of these operations which I have performed is limited, and compared with the great number in European clinics, may seem trifling, but I think, sufficiently demon-

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* The Histology of the Lachrymal Gland in Chronic Dacryocystitis. Transactions of the American Ophthalmological Society, 1900.

strate, to my mind, at least, the value of this procedure. I have removed
the lachrymal sac eighteen times, three times in children and the remain-
ing times in adults. Among the adults four were insane patients. The
operation was successful in every instance in promptly relieving, and, in
the majority of cases. in totally stopping the annoying epiphora. All
of the cases could be classified as chronic dacryocystitis with stricture of
the duct. In three of them there was great distention of the sac, and
in one the sac was deeply stained by the prolonged use of protargol.
In one instance only was it necessary to remove the lachrymal gland for
continued epiphora. In one other the same procedure applied to the
palpebral portion of the gland was practiced. It does not seem neces-
sary to give the clinical histories of these cases in detail. A number
of the sacs have been submitted to microscopic examination. I will
describe five of these in order to give an idea of the pathological find-
ings.

PATHOLOGICAL FINDINGS.

CASE IV.—Chronic dacryocystitis, with purulent discharge from canaliculi,
and stricture of the nasal duct. Insane patient, Blockley Hospital, operation
10.17.00.

The epithelium is intact over the surface of the sac and is mainly a represen-
tative of the ordinary stratified columnar epithelium. Upon it are exudates of
leucocytes. The mucosa is densely infiltrated with small round cells, and in
many places these cells are gathered into circular masses which project inward,
and over these projections the epithelium is degenerated and eroded. The
sac wall is densely fibrous and the bloodvessels are enlarged and engorged.

DIAGNOSIS.—Diffuse inflammation and catarrh of lachrymal sac.

CASE IX. Chronic purulent dacryocystitis, with argyrosis of the conjunctiva
and lachrymal sac from the use of protargol.*

The pigment is not deposited in the epithelium, but in the submucous tissue
along the elastic fibers which make up the meshes of the tissue. The epthelium
lining the sac consists of tall cylindrical cells, below which two rows of poly-
gonal cells are evident resting upon a basement membrane. The latter is
densely covered with the pigment patches. In addition to uniform incrusta-
tion around the elastic fibers, some pigment grains are deposited free in the
tissue, although many of the apparently free particles should be regarded as

* Transactions American Ophthalmological Society, 1903.

cross sections of the incrusted fibrils. The pigmentation extends to a depth of three-quarters of a millimeter below the basement membrane and outlines the meshwork of the tissues with beautiful distinctness. The surface of the sac is denuded in many places and the number of lymphoid cells greatly increased, so that the wall of the sac is greatly thickened and all structures of the sub-mucous tissue obscured. In addition to the pigment around the elastic fibers, it may be seen outlining the inner wall of the capillaries. It is brownish-yellow by transmitted light.

DIAGNOSIS.—Diffuse inflammation of lachrymal sac and argyrosis.

CASE XIII. Chronic purulent dacryocystitis. Insane patient, Blockley Hospital, operation 12.6.03.

The epithelium is intact throughout the whole surface with marked leucocytic infiltration between the cells. The surface is free. The mucosa shows moderately dense fibrous tissue with some infiltration by leucocytes and embryonic connective tissue corpuscles. The deeper coats are densely fibrous and the vessels moderately injected. There are perivascular collections of embryonic connective tissues.

DIAGNOSIS.—Catarrhal dacryocystitis with minor diffuse inflammation of the sac wall.

CASE XIV. Chronic dacryocystitis, with purulent discharge and stricture. Adult patient in the University Hospital. Operation 10.28.04.

The epithelium is present over the surface, and upon it are an exudate of leucocytes, a small amount of fibrin, a few red blood corpuscles and amorphous material, probably mucus. The epithelium is infiltrated with leucocytes. The mucosa is thickly studded with embryonic connective tissue cells and leucocytes. The vessels are injected. The fibrous coats show intense injection of vessels with hemorrhages and irregular areas of embryonic connective tissue formation. In some of the lmyph spaces of the fibrous coats the endothelium is thickened and apparently proliferated.

DIAGNOSIS.—Acute hemorrhagic and purulent diffuse inflammation and catarrh of lachrymal sac.

CASE XV. Chronic dacryocystitis with fistula and enormous dilatation of the sac. Adult patient in University Hospital. Operation 10.28.04.

The epithelium is continuous on the interior of the sac. It is made up for the most part of ordinary stratified columnar epithelium, but in a few positions has the appearance of a ciliated border. At one position, over a projecting mass of lymphoid cells, the strata of epithelium are reduced in number and the cells are lower, approaching the cuboid type. There is more or less leucocytic infiltration between the epithelial cells. Here and there are mucoid goblet cells. The mucosa is mainly made up of lymphoid elements and polynuclear leucocytes. The lymphoid cells are embryonic connective tissue cells. In one position is quite a mass projecting into the lumen of the sac, and espe-

cially in this place are congested capillary vessels among the cells. The deeper coats are densely fibrous with vessels congested and lines of vessels marked by thick perivascular collections of embryonic connective tissue corpuscles. (Fig. 1.)

Chronic Dacryocystitis (for description see case XV)

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DIAGNOSIS.—Diffuse inflammation of the sac wall with especial involvement by a catarrhal inflammation of its lining.

Extirpated sacs have been examined a great many times. Berlin in his early papers makes reference to the appearance of polypi upon the sac and to the catarrhal condition of the mucous membrane. My examinations seem to me interesting, not because the pathological findings show anything that was not known before, for it will be observed that all of the sections exhibit some form of chronic catarrhal inflammation of the sac, or else acute hemorrhagic and purulent inflammation, in other words, the conditions which we would expect to find in dacryocystitis, but because they give a very definite pathological reason why the so-called conservative measures are so tiresome and frequently so unsatisfactory. What is the use of putting patients through weeks of uncomfortable treatment, which often drags out into months, when a simple operation, which lasts fifteen or twenty minutes, and which may be done either under local or general anesthesia, in the vast majority of instances permanently relieves them of their trouble? How could one expect probing and irrigation to do away with the lessons which, for example, are seen in these sections. The scar is hardly perceptible; indeed, if the cut is carefully made it is not at all perceptible after a few months, and I have never seen a patient of this character after an operation like the one which has been described who would not be willing to submit the second eye to the same operation if that also were similarly affected.

Personally, I have almost stopped using probes. I would not for a moment say that conservative treatment, particularly careful syringing of the sac, and massage over the sac with suitable antiseptics, was not a proper method to be tried, but if it fails and suppuration continues, rather than submit a patient to weeks of probing, I would always excise the lachrymal sac. It is interesting to note, as Axenfeld has done, that none of these patients exhibited caries of the lachrymal bone, which, far from being common, as is ordinarily stated, is distinctly the exception.

SYPHILIS OF THE LUNG SIMULATING PHTHISIS.

By WILLIAM E. HUGHES, M. D., and ROBERT N. WILLSON, M. D.

As early as 1858 Virchow described a pulmonary condition which he called "white hepatization," and which he noted especially in the lungs of syphilitic newly-born infants. He also noted a brown induration, and a collection of brown pigment in the lungs of a number of adults, accompanying a similar congenital "white hepatization." This pigmentation he considered due to an impediment to the blood stream in its passage through the pulmonary tissue, consequent upon the filling of the alveoli by round cells. Virchow apparently did not feel, however, like committing himself to the statement that these hepatized areas were undoubtedly syphilitic processes.

Wagner in 1863, Pavlinoff in 1879, Schnitzler in 1879, Hiller in 1884, Heller in 1888, and more recently many others, including Councilman, Greenfield, Kidd, Perry, Rolleston, Weber, Wilks, Aufrecht and Stengel, have also reported cases of apparent syphilitic pulmonary involvement. The question is often asked, "In cases that do not come to autopsy can we be sure that the process has not been of a simple bronchopneumonic character, or even of a tubercular nature; especially since tuberculosis is a frequent accompaniment of syphilis?"

When such pathologists as Virchow fail to positively diagnose the condition under the microscope, how indeed are we to assure ourselves of the clinical condition in a doubtful case of pulmonary involvement in a syphilitic patient? And still more difficult, how shall we make the diagnosis in the presence of a doubtful pulmonary lesion in a case supposedly not, but actually syphilitic? These are not only interesting queries, but practical issues, as the instance reported in this paper will demonstrate:

H. H., white, aged 32. Born in Russia. Now an ironworker. His father, mother, two brothers and two sisters living and well. Patient has had measles and smallpox. Has been repeatedly exposed to venereal infection, but denies having suffered from venereal disase of any description. Claims never to have had a chancre or other sore upon his penus, or elsewhere on his body. Has experienced no sore throat, no alopecia, and no eruption. Has always

been engaged in hard labor, for years as a sailor, and recently as an iron-worker. Six weeks prior to admission to the Philadelphia Hospital, on December 31, 1903, he contracted a "severe cold," which persisted about a month. He then became stronger and better physically, but the cough continued, as did also the expectoration, which had been profuse from the outset. About December 15, 1903, he began to expectorate blood. At first this appeared in occasional small streaks in the sputum, but has gradually increased in quantity until at the time of admission it appeared in quantity with every coughing attack. The patient then appeared well nourished, of large muscular frame, his skin of good color, and, except for his cough, he felt perfectly well. He was merely frightened at the continual loss of blood. The physical examination found his mouth and throat normal in appearance, the glands of the post-cervical and sternomastoid regions not palpable, the pulse rapid and small, and not easily compressible. The pupils were equal and reacted promptly to light and distance. The patient was right-handed, but on inspection the right chest seemed more prominent than normal, especially over the lower portion. The expansion was relatively impaired over this area, though still remarkably free. The measurement of the right chest from mid-sternum to the spine at the level of the eleventh spinous process was 20 inches (50 cm.); that of the left side at a corresponding level was 18 inches (45 cm.); at the height of the scapular spine the right chest measured 20⅜ inches (50.9 cm.), and the left side 19⅝ inches (49 cm.). The expansion over the pulmonary bases was, on the right side three-quarters of an inch, and one-half inch on the left. Percussion resonance was also impaired over the entire right lower lobe, especially posteriorly; and the expansion was almost absent over this area. Tactile fremitus was slightly increased. On deep inspiration over a space as large as the palm of the hand, just below the upper border of the right lower lobe, fine crackling rales and a scraping friction sound were heard. Percussion over this area also gave distinct dullness, not amounting to flatness. Above and to the outside of this area skodaic tympany was easily obtained. The middle and upper lobes on the right side showed prolonged and harsh inspiratory and expiratory sounds, but no other abnormality. The right apex was negative anteriorly and posteriorly. The left lung appeared to be altogether normal, except for a rather poor expansion. The abdominal examination was negative. There was no eruption on any portion of the body, and no scar nor induration was discoverable on the penis. The glands were enlarged only in the inguinal region, where both the deep and superficial chains were palpable on both sides.

From December 31, 1903, to the date of his discharge, January 14, 1904, the temperature, which was 100 degrees Fahrenheit on admission, varied between this point and 97 degrees Fahrenheit, where it was disposed to remain during the last days of his stay in the hospital. The pulse was 110 on admission, and averaged 90 during the subsequent period. The respirations gradually fell from 30 to normal. The blood showed only a slight reduction of hemoglobin; the urine was normal.

The patient experienced little or no discomfort on the right side, but had a constant hacking cough, and brought up enormous quantities (two or more

(3)

sputum cupsful) of sanguinopurulent matter daily. The expectoration was very profuse in the morning, shortly after rising. There were no night sweats; there was little or no loss of weight; the appetite was good, and the general impression given was that of a man with a strictly localized pulmonary lesion, and a general economy that was still amply competent to combat its advance.

On the presumption that the latter was tuberculous, the sputum was examined repeatedly, but on no occasion could tubercle bacilli be detected. Pneumococci were present in numbers. On January 6, 1904, there was no cessation on the part of the pulmonary bleeding, which had now become so free that there was more blood than mucopus in the sputum. The latter invariably showed, however, a thorough admixture with the blood, assuming rather a prune juice than a bright red color. The patient was demonstrated on this day in Dr. Hughes' clinic, and an exploratory puncture made in the eighth interspace in the midscapular line. The first puncture yielded no fluid, probably owing to a faulty mechanism of the apparatus. The second insertion of the needle, however, to our surprise, gave a syringeful of dark red blood, floating in which were large flakes of lymph, evidently from the surface of the pleura. The wound was sealed, and the patient returned to the ward in good condition, but still expectorating blood and mucopus as before.

In the doubt as to the diagnosis three conditions seemed possible, with the probability in the following order of mention: Incipient pulmonary malignant disease, tubercular phthisis and syphilis. It seemed to be very improbable that the lesion was parasitic (actinomyces, hydatid, etc.), since no evidence pointing to such an origin could be discovered in the sputum. Calcium chlorid and gelatine were employed, together with prolonged absolute rest in bed, but without effect upon the pulmonary bleeding, which appeared to be on the increase. This fact, together with the absence of constitutional involvement, and the circumstance that the patient appeared to be in excellent physical condition, seemed to render tuberculosis unlikely, though still, of course, possible. Syphilis was also considered, though deemed unlikely in the light of the entire absence of a history of primary, secondary or tertiary lesions. Moreover, pulmonary syphilis is by no means a frequent occurrence in medical literature.

The most probable condition, therefore, appeared to be an early malignant, in all likelihood sarcomatous, involvement of the lung and pleura, and the tentative diagnosis of sarcoma was accordingly made. Microscopic examination of the flakes of lymph, obtained in the fluid drawn by puncture, it should be stated, gave no clue as to the nature of the pathologic process.

More as a matter of interest and empiricism than with the expectation of alleviating the symptoms, the patient was (January 7, 1904) placed upon large doses of potassium iodid (1 ʒ t. i. d.) in the idea that

harm could be done only in the unlikely event that the condition was tuberculous. To our astonishment and satisfaction, within 24 hours the expectoration diminished in quantity, and the patient stated that he was bringing up less blood. The treatment was persisted in, and after three days the sputum, while still free in quantity, contained no blood, the cough had largely disappeared, and the patient insisted on leaving the hospital, in the belief that he was cured. He was persuaded to remain four days longer, and on January 14, 1904, could no longer be detained, and was lost sight of. When discharged he was free from cough, his sputum was mucopurulent, but in slight quantity, and he himself felt perfectly well. The respiratory sounds over the area of former consolidation were still rough, and moist rales could be heard; the percussion note, however, was almost similar in like positions on the right and left sides, and indicated a resumption of its function on the part of the vesicular structure. In looking back upon this case it is natural at once to suggest that the condition may have been one of bronchopneumonia, with delayed resolution, the latter taking place finally at a time coincident with the administration of potassium iodid. This appeared to us so unlikely, however, that we excluded it in favor of less unlikely conditions. The duration for at least twelve weeks without seriously affecting the general condition of the patient, the free expectoration of prune juice fluid, beginning with the eleventh week of the disease, and the prompt and seemingly almost complete recovery from active symptoms within a week of the first administration of iodid of potash, all seem to point to a condition other than that of a simple bronchopneumonic consolidation.

Malignant disease it certainly was not, in the light of the result of treatment. Equally certain is the fact that we must now exclude tuberculosis, which, though sometimes remaining stationary under the influence of potassium iodid, is usually urged on into an acute excerbation, and never is benefited by the drug.

We have remaining but one probable condition, pulmonary syphilis, and our diagnosis rests simply and solely up to the present moment upon exclusion and upon therapeutic grounds. In speaking of this case to a genitourinary specialist, we were received with the comment, "So this is what the internist calls syphilis!"

We would reply, "If not syphilis, what else?" There are many discoveries made by so-called chance, and by so-called experiment, and some of our most valuable items of knowledge have been obtained by reasoning "backward," as it were, this method being the only one that

offers a purchase from which to reason and observe in the right direction.

Even in the absence of the classical eruption, and the evidence of a primary sore, and even lacking a general glandular enlargement (none of which we believe to be indispensable accompaniments of latent syphilis) we feel compelled to look upon this case as one of pulmonary syphiloma, at first latent, and then manifesting itself by the symptoms of a localized pulmonary lesion. Until our friends, who have up to this time spent their lives in a vain quest for the causal germ of syphilis, proclaim the success of their pursuit, we shall consider it our duty, from the double standpoint of the patient and the clinician, to regard such conditions as respond promptly to treatment by potassium iodid or mercury, and to no other, as luetic; provided, of course, that we find no evidence suggesting another condition as more probable.

It is interesting from the pathologic standpoint, and in view of Virchow's comment upon the occurrence of brown induration and pigment and its histogenesis, that so many of these cases present hemoptysis as a prominent clinical feature. Aufrecht's case is especially noteworthy in comparison with our own, in that the autopsy showed the presence of a tumor of coagulated blood, arching over the left bronchus, and pressing upon the tracheal wall. The tumor was formed "by an almost globelike dilatation of the aorta, as large as a plum," communicating with the lumen of the arch by an opening 1 cm. in diameter. The result of puncture in our case might well have been consequent upon the insertion of the needle into some such aneurysmal clot, or equally well into a circumscribed extravasation, due, as suggested by Virchow, to an impediment to the blood stream. In the latter event the stage of the disease when observed by us must have been one antecedent to that of brown induration and pigmentation.

Stengel gives the post-mortem findings in one case of undoubted pulmonary syphilis, of which the clinical history was lacking. He also submits the history of another case, at first looked upon and treated as an instance of pulmonary tuberculosis, but recovering after six months of treatment with potassium iodid. The latter case is open to the objection, of course, that the improvement was so slow as to admit of question whether it was not a case of phthisis after all, recovering in spite of the use of potassium iodid. Many cases of recognized incipient phthisis do indeed recover symptomatically, within an even shorter period. In other words, the improvement may or may not have been due to the antispecific treatment. Certainly, however,

the iodid had no deleterious effect. Stengel also quotes the interesting case of Brambilla, of a supposedly tubercular patient being given the mercurial inunction intended for a syphilitic in the adjoining bed, followed by his prompt recovery from all his symptoms. The clinical histories of such cases must have at least one important influence, in the direction of proving that a certain few cases, apparently tubercular, will improve and convalesce symptomatically under antisyphilitic treatment. This once determined, the question as to whether we can rightfully call them instances of pulmonary syphilis, assumes secondary importance.

The probability approaches a certainty more nearly with each new case, and in due time a sufficient number of post-mortem records will have been obtained in cases that have shown just such a clinical history, and the doubt will be dispelled.

In the meantime the uncertainty will cause some hesitation in the positive diagnosis of incipent tuberculosis in subjects known or suspected of being syphilitic.

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A STUDY OF 91 OPERATIONS FOR THE RELIEF OF VARIOUS FORMS OF HERNIA WITH THEIR COMPLICATIONS.

By Orville Horwitz, B. S. M. D.

The operations performed by us for the relief of various forms of hernia as here set forth represent the work achieved during the past twelve years in private practice, at the Philadelphia Hospital, and at the Jefferson Medical College Hospital. Unfortunately the majority of patients were inmates of either one or the other of these establishments, and consequently many were lost sight of after they had quitted those institutions, so that the number of cases which permanently recovered after a radical cure had been attempted cannot be definitely ascertained. The opportunity has been afforded us in twenty-nine cases to watch the permanency of the results obtained by operation, and from this number we are in position to give some definite information regarding the subject.

As none of the cases under consideration were adapted to the employment of any of the palliative measures in vogue which are applicable to so many forms of hernia, this important division of the subject will not be considered in the study of the cases herein recounted.

The various operations performed are classified as follows:

      32 indirect inguinal hernia (strangulated).
      27 cases indirect inguinal hernia (radical operation).
      8 cases indirect inguinal hernia (palliative).
      5 cases direct inguinal hernia (strangulated).
      1 case direct inguinal hernia (radical operation).
      3 cases direct inguinal hernia (palliative).
      3 cases femoral hernia (strangulated).
      2 cases femoral hernia (radical operation).
      3 cases umbilical hernia (strangulated).
      3 cases umbilical hernia (radical cure).
      4 cases ventral hernia (incisional) radical operation.

The complications were: One case of bilateral hydrocele with inguinal hernia; radical cure.

Two cases of unilateral hydrocele, inguinal hernia; radical cure of both.

One case of tuberculosis of testicle, inguinal hernia; castration with radical operation for hernia.

Four cases of inguinal hernia with undescended testicle; castration and radical operation for hernia.

Three cases of inguinal hernia with undescended testicle; transplantation of testicle and radical operation for hernia.

One case of inguinal hernia with encysted hydrocele of cord; radical operation for both conditions.

One case of long-standing strangulated femoral hernia, gangrene of bowel with rupture, necessitating abdominal section (Richter's hernia).

One case of hernia reduced en masse, necessitating abdominal section.

One case of appendicial abscess rupturing into an inguinal hernia sac.

One case of long-standing hematoma of the tunica vaginalis testis with large incarcerated omental hernia simulating malignant disease of the testicle.

In two cases of strangulated inguinal hernia, an ovary was found in the sac in one, and a portion of the bladder in the other. Gangrene of the constricted bowels in seven cases necessitated the establishment of an artificial anus; bowel opened without disturbing constriction, and left in situ in one; resection of bowels in three cases and the removal of a doubtful spot about the size of a thumb nail, with closure of the opening in one.

Death ensued in sixteen cases, as follows: One femoral, two umbilical, one direct inguinal, twelve indirect inguinal hernias. In twelve of the cases death was due to peritonitis; strangulation had existed for many hours before resorting to operations, taxis having been persisted in for a lengthened period without avail. Of the four remaining cases, one died from exhaustion, one died from intestinal perforation of a damaged bowel following operation; probably caused by intestinal distension succeeding paralysis of the bowels. Death occurred on the fourth day after the operation. In one, where the individual suffered from chronic Bright's disease, uremia developed. In this case local anesthesia had been employed. The remaining case was one where a radical operation had been attempted for the relief of a large reducible hernia. Examination of the urine before operation showed the kidneys to be healthy; suppression of urine intervened, and the patient succumbed.

Operations for the relief of hernia may be divided into three classes. 1st. Herniotomy, an operation which is performed when strangulation exists; it is always an emergency operation; the mortality depending not only on the age, character of the hernia and the condition of the patient, but is greatly influenced by the length of time that the protrusion has continued, as well as the amount of force put forth, and the duration and frequency with which attempts at taxis have been made.

2d. The so-called "radical operation," where the hernial protrusion is not strangulated and an effort is made to effect a permanent cure.

3d. A palliative operation, by which is meant surgical intervention in cases where, owing to the large size of the hernia, atrophy of the muscular structures of the abdominal wall ensues; the large size of the hernial outlet, and the changed condition of the inguinal canal exists, and a permanent cure following a radical operation is not to be hoped for. Nevertheless, in properly-selected cases, individuals suffering from this condition are materially benefited by surgical interference. The general health improves; the obstinate constipation so frequently associated with this state is relieved. The annoying sensation of abdominal tension and pain disappears; the patient being able to keep the contents of the hernial protrusion within the abdominal cavity by means of an apparatus, an impossibility before surgical interference.

Forty-two operations were performed for the relief of different forms of strangulated hernia, of which number three were femoral, three umbilical, five direct and thirty-two indirect inguinal. It is significant to note that in every instance where death resulted from herniotomy the operation had not been performed for several hours after the constriction occurred, and in almost every instance violent and prolonged taxis had been made at short intervals for a lengthened period of time. In one case, that of an old man, 73 years of age, the strangulation was unrelieved from 4 o'clock in the morning until 8 in the evening, during which time the patient was kept constantly under the influence of ether, taxis being frequently resorted to. On opening the sac the tissues were found to be blood-stained and the serous coat of the bowels stripped off in patches. The intestines presented a most doubtful appearance. The report of many similar instances is to be found in the literature on the subject. This statement is confirmed by reference to the Year Book of Medicine and Surgery for 1903, where several cases that had occurred during the last year are reported. Bertram cites four cases of strangulated hernia where the bowels were found to be gangrenous and resection became necessary. In each in-

stance the rupture was supposed to have been produced by forcible taxis. In one case Da Costa discovered a disorganized and crushed testicle in the inguinal canal following the manipulations made to relieve a strangulated hernia.

Gibbon operated upon a case of intestinal obstruction where a strangulated hernia had been reduced during the preceding forty-eight hours. Eight inches of the bowel were found to be gangrenous, making resection necessary.

Crowley (Dublin Journal Medical Science, July 1, 1895), writing on this subject corroborates our views when he says: More injury is invoked in a few minutes by brute force taxis than the constriction could cause of itself in several days." He very aptly paraphrases the old adage of Desaut: "To think well of a strangulated hernia when taxis has not been used" into "Think favorably of a strangulated hernia when taxis has not been abused." "Dangerous as taxis is in unskillful hands, it is often the cause of death in experienced hands by the dangerous delay in operating."

From a compilation of statistics of St. Bartholomew's, St. Thomas' and Guy's Hospitals from May, 1861, to October, 1892, by Croft (The Hospital, Volume XIII, 1895), the inference is drawn that the death rate of herniotomy is largely increased by the unnecessary delay which is allowed to take place between the occurrence of the strangulation and the operation. Bowlby concurs in this view and adds that "In cases in which the strangulation is of long duration the danger of death is increased by having to perform a serious operation on a patient who is exhausted from starvation, pain and vomiting." It is now generally conceded that taxis should not be resorted to if the strangulation has existed for two days, or even one day; if there be local signs of inflammation, edema, emphysema, gangrene, or if stercoraceous vomiting be present, or when the patient is in a condition of collapse, or where the hernia is found to be irreducible before strangulation supervened; nor should an effort at reduction be made in cases where the patient is brought to the hospital with a history of the strangulation having existed for some hours, during which period violent, unsuccessful efforts have been repeatedly made. The majority of surgeons are in accord, in the belief that an inflamed hernia should always be treated by operation and never by taxis.

We believe that gentle taxis should be attempted for the period of about ten minutes after the strangulation occurs. Should this fail. preparations should at once be made with a view to an operation. As

soon as the patient is under the influence of an anesthetic, another
gentle effort should be made to remove the constricted bowel, if this
does not succeed an immediate operation should be resorted to. It is
generally conceded that taxis of a strangulated femoral hernia is
fraught with more danger than that of the inguinal variety (Craly).
Cases are recorded of rupture of the bowel occurring in violent efforts
at reduction in femoral hernia; statistics prove that there is more
danger of a reduction taking place en bloc, when the protrusion occurs
at the femoral than at the inguinal outlet. Taxis therefore can be
persisted in for a longer period and with less danger when the rupture
is of the latter than of the former variety. It is true that in a small
percentage of cases, delay, the local employment of ice, etherization and
taxis will sometimes result in relieving the strangulation. The number
of cases where this method of treatment succeeds is so small in com-
parison with the numbers that fail that it is wise to err on the safe
side and operate early, thereby preventing the individual being brought
to the operating table with a damaged intestine, and reducing the
chance of recovery. We feel assured that no modern surgeon would
be content, after a fair effort at taxis had failed, to allow several hours
to elapse without affording operative relief to the patient, and would
object to trusting to time and renewed resort to taxis to reduce the
hernia. Symptoms of intestinal obstruction persisting after reduction
of a strangulated inguinal hernia call for immediate abdominal section,
as the probability is that the hernia has been reduced en masse. One
symptom that we have observed to be frequently present, characteristic
of acute intestinal obstruction, is the peculiar character of the uncon-
trollable vomiting; the individual turns on his side and ejects a large
quantity of watery, mucoid material, sometimes tinged with greenish
bile. This is repeated at short intervals until the bystanders frequently
wonder from whence all the fluid matter is derived.

A case of this description came under our observation during the
past winter. We were called to see a strangulated hernia, which the
hospital resident had been unable to reduce. Under the influence of an
anesthetic reduction was easily accomplished. On visiting the institu-
tion late the following afternoon we were informed that the patient
was suffering from ether vomiting, which had continued from the time
taxis had been resorted to. Examination disclosed the fact that the
abdomen was somewhat tender and rigid on the left side; there was no
atension. Temperature, 99 degrees; pulse, 110. At intervals the
t would turn on his side and eject large quantities of fluid matter.

On opening the abdomen the hernia was found to have been reduced en bloc; a fibrous band was found constricting the bowel, which was gangrenous, necessitating resection. It is important to see that the bladder is emptied before taxis is made. In one case which came under our cognizance, an old man, 75 years of age, with a strangulated inguinal hernia, there was also retention of urine, the bladder being distended almost up to the umbilicus. Repeated efforts at reduction had been made without avail. The patient was catheterized, after which the protrusion was returned without much difficulty.

The so-called "Richter's" hernia is an unusual occurrence, and it is thought a brief history of the ailment as it presented itself to us will not be uninteresting. The patient was a middle-aged man, who had been an inmate of the Insane Department of the Philadelphia Hospital for some years. Owing to his mental condition an accurate history of the case could not be obtained. The attendant stated that he noticed that the patient had been ailing for a day or so. There was some nausea and vomiting, and he acted as though he were in pain. Purges of various kinds were administered without success. Temperature rose to 102 degrees; pulse, 115. The abdomen becoming distended, it was de-cided to transfer him to the surgical wards of the institution. On examination a small lump was discovered, located over the femoral outlet, about the size of a large marble. It was hard, indurated and slightly movable; no impulse on coughing. A strangulated femoral hernia was suspected, but the resident stated that the lump had existed for at least two weeks before the patient was taken ill, and had been treated as an enlarged lymphatic gland. An exploratory abdominal operation was decided upon. On opening the peritoneum, gas and fecal matter escaped. There was diffuse peritonitis. It was found that a portion of the circumference of the ileum had become constricted at the femoral outlet, which was gangrenous, accompanied by rupture, with extravasation of the contents of the bowel. The intestine was resected, a circular enterorrhaphy being performed. All symptoms of obstruction disappeared. The bowels moved freely several times after the operation. Patient died of general peritonitis on the fourth day after operation. Post-mortem examination showed the anastomosis to be perfect.

The following case is of interest from the fact that a gangrenous omental hernia existed with practically no constitutional symptoms. The case was seen in consultation with Dr. Stillwell in January last. The patient was 42 years of age; had suffered for two years from a reducible inguinal hernia, for which he had worn a truss. Three days

before he was first seen by us the hernia had become distended and re-
duction was impossible. As it gave rise to no pain, no further atten-
tion was paid to it until the following day, when it began to be more
or less tender. Unsuccessful efforts at reduction had been made by his
physician. The tumor began to increase somewhat in size, the over-
lying skin becoming reddened and the parts tender to the touch. Tem-
perature rose to 102 degrees; there was slight nausea and vomiting, but
no symptoms of obstruction, the bowels moving freely. When first
seen the hernia was found to be about the size of a lemon, tender to
touch; temperature, 99 degrees; pulse, 120. On opening the sac a mass
of gangrenous omentum was exposed to view. The interesting feature
of this case is the fact that with a partly gangrenous omentum that
there should have been little or no constitutional symptoms. Before
operation the temperature had fallen from 102 degrees to 99 degrees;
the tumor was tender on pressure, but there was less pain than there
had been previously; the most significant point being the pulse, which
was 120, and quite out of proportion to a temperature of 99 degrees.

Of the cases of inguinal hernia operated upon, with the exception of
three, these being among the earliest herein recounted, the incision
employed was similar to that made for the radical cure in non-strangu-
lated cases. The advantage of this mode of exposing the sac over the
old method of raising a fold of skin, at right angles to the external
abdominal ring, and transfixing it, is too obvious to need any comment.
In two cases where the bowels were gangrenous, the general condition
of the patients being desperate, the constriction was not molested; the
gangrenous portion of the bowel was freely incised and left in situ.
One individual recovered, and the other died, apparently from exhaus-
tion, the patient being well-nigh in articula mortis at the time of opera-
tion. In a third case the gangrenous portion of the intestine was re-
sected and the divided ends of the gut stitched to the edges of the
wound. This person recovered with the formation of a fecal fistula.
In three cases resection of the gangrenous portion of the intestines was
performed; one being a strangulated femoral hernia, the so-called
"Richter's" variety already alluded to; the second, a strangulated um-
bilical hernia; and the third an indirect inguinal hernia. The latter
recovered; the other two died of peritonitis. In one case it was found
that the area of gangrene was limited to a spot about the size of a thumb
nail. This was resected and the wound closed by continuous Lembert
suture. The patient made an uninterrupted recovery. The Murphy
button was employed in one instance, the patient's condition being such

at the time of operation as not to warrant unnecessary delay. In one case the O'Hara anastomosis forceps was employed and found to be most satisfactory. We, as a rule, do not advocate the employment of any of the various instruments devised to accelerate the operation of intestinal anastomosis. We have been able to resect and make an anastomosis quite as quickly without the aid of any of the devices suggested as with them. It is a great advantage to acquire the dexterity of operating rapidly without being hampered by the use of special instruments.

The advantages to be derived from a resection of a gangrenous bowel with anastomosis over that of establishing an artificial anus are too evident to need comment. It is only in those cases where the patient's condition is such that any unnecessary delay would add to the danger of a fatal result that an artificial anus should be established. Local anesthesia was employed in cases where the patient's condition at the time of operation was desperate. It was not found, as is so frequently claimed, that the intestines could be manipulated without pain.

In every instance where the patient's condition warranted the attempt an effort was made to effect a radical cure after the constriction had been relieved and the contents of the sac returned. The additional work necessary to produce a permanent cure, as a rule, requires but very little additional time, and should always be attempted whenever possible. In cases where general peritonitis existed, accompanied by paralysis of the bowel, the method of treatment suggested by Dr. Andrew J. McCosh (Annals of Surgery, June, 1897), was adopted:

Two ounces of a saturated solution of sulphate of magnesium was injected into the small intestine as high up as possible by means of a hollow needle attached to an aspirating syringe, the little wound of the bowel being closed by means of a Lembert suture. We are convinced that in at least three cases life was saved by this means of treatment. When peritonitis was present the abdominal cavity was irrigated with a large quantity of hot normal salt solution and drained. If there had been no injury to the bowel, ten grains of calomel was administerd as soon as the patient had recovered from the effects of the anesthetic. A large dose of the mild chloride of mercury in paralysis of the bowel, with marked distension, is always beneficial; not only does it have a tendency to induce peristaltic action, but it is an excellent diuretic, having a proneness to prevent suppression of urine, which sometimes accompanies abdominal complications. Small doses of the remedy, repeated at short intervals, will not produce the active vermiculation which is obtained by the administration of a single large dose.

In one case of strangulated hernia, on opening the sac, after separating the omentum and intestines, there was found to be, lying posteriorly, what appeared to be a cyst. The nature of the cystocele was not at first recognized, protrusion of a portion of the bladder being suspected; the urine was withdrawn by means of a catheter, when the tumor immediately subsided, thereby verifying the diagnosis. There were no symptoms present before operation which would tend to show that the bladder was in any way connected with the hernia. We have had the opportunity to observe two similar cases; they were inmates of the Philadelphia Hospital, and came under the care of our colleagues. In neither case was there any symptoms present that would lead a surgeon to suspect that the bladder was in any way implicated. In one of the patients the bladder was opened by mistake, and in the other the organ was recognized and returned to the abdominal cavity. Hernia of the bladder may occur alone or it may be associated with a protrusion of the intestine and omentum. The diagnosis of the condition is but rarely made before operation. The condition may be suspected if there is an unexplainable frequency of micturition, and the history of the tumor shows that it diminishes in size or disappears after urination. The suspicion that the bladder forms a portion of the hernial contents can be determined by drawing off the urine, by means of a catheter. On removing the urine the size of the swelling will diminish; after evacuating the bladder it can then be dilated by means of either air or water, and the tumor will immediately reappear.

The following case serves to illustrate the fact that the condition is but seldom suspected before operation:

A patient was admitted to the Genito-Urinary department of the Jefferson Hospital in July last on account of a urinary fistula in the right groin, communicating with the bladder, through which there was a constant dribbling of urine. Two years previous to his first visit to the Jefferson Hospital a surgeon, connected with another institution, had operated upon him for what was presumed to be an inguinal hernia. The tumor was found to contain the bladder, which was accidentally incised and left in situ, giving rise to a permanent urinary fistula. A plastic operation was performed, closing the opening; the ient was discharged cured three weeks later. The cross in the ac-ing picture shows the position of the opening of the fistula.

Urinary fistulæ communicating with bladder following operation upon original hernia. X shows position of fistulous opening.

Charles Adams reports a case in the Clinical Review, Vol. XII, No. IV, of a child who was affected with the usual symptoms of inguinal hernia, no vesical symptoms being present. On opening what was presumed to be the sac, it was discovered that the surgeon had incised a diverticulum of the bladder. Hernia of the bladder alone may be mistaken for an ordinary hydrocele or a hydrocele of a hernial sac. Several cases are on record where a hernial protrusion of the bladder has been tapped under the belief that the cyst was a hydrocele of the vaginal tunic. On opening the sac the bladder may be recognized, if present, by the discovery of what appears to be a cystic tumor, which usually forms part of the wall of the sac; the usual presence of fat over the cyst, and outside of the sac, the characteristic unstriped muscular fibres, composing the wall of the bladder, and also occasionally the longitudinal veins which are found in the vicinity of the fundus of the organ, which are frequently much engorged and consequently prominent, should aid in making a proper diagnosis. Moreover, when the sac has been twisted, preparatory to resection, if the bladder be included, suspicion should be aroused by the unusual thickness of the structure.

Brunner divides hernia of the bladder into three classes, extraperitoneal, paraperitoneal and intraperitoneal.

Vesical hernia is said to be more common in men than in women. It usually occurs with the inguinal variety, although a few cases are on record where it has been found to exist as a femoral protrusion. It is more common on the right side. According to Eccles it is present in about 1 per cent. of the inguinal cases. In the Beiträze zur klin. Chirurgie, Band 35, page 140, Lossen reports three cases of hernia of the bladder that came under his observation; all of the inguinal variety. In studying the literature of the subject, he found that out of 3000 operations for hernia, a portion of the bladder was found in 1.6 per cent. of the cases. The most elaborate review of the literature on this subject is to be found in an article published by Alessandri in the Annals des Mal. des Org. Gen.-Urin., of January, February and March, 1901.

When a portion of the bladder is found to form a portion of the contents of the hernial sac, it should be freed from any adhesions that may exist and returned to the abdominal cavity. Should the protrusion of the viscus assume the form of a diverticulum, it is generally considered wisest to resect the pouch and close the opening made in the bladder by two rows of sutures.

In a private case operated upon at St. Joseph's Hospital for what was presumed to be an incarcerated inguinal omental hernia, the sac was found to contain the ovary and Fallopian tube, with a piece of indurated omentum. The latter was resected and the ovary and tube freed from adhesions and restored to the abdominal cavity. The tumor had existed for three years, during which time it had been gradually increasing in size with increased induration. The patient stated that it was the seat of much pain during menstruation. The cause of this was inexplicable before operation.

Little is known as to the etiology of hernia of the ovary. The diagnosis is but seldom ascertained before the operation. The condition may be either acquired or congenital; the latter form being the most common. The sac may contain only the ovary or the Fallopian tube; both structures, however, may be present, associated with other viscera. The rupture usually occurs on the left side; cases are on record where the protrusion has been bilateral. Statistics show that the inguinal variety is by far the most common. The ovary has been found in Scarpa's space, and even in the oburator foramen. So far as we have been able to ascertain, there is no case on record where the ovary has been found associated with a femoral hernia.

In the Annals of Surgery for March, 1901, Paul F. Morf, in reporting a case of inguinal hernia in which was found a bit of omentum and the Fallopian tube, without the ovary, collected the reports of twenty-four similar cases in which thirteen were inguinal, five of whom were infants; ten were crural and one was obturator.

A study of hernia and its literature during the past fifteen years shows that the subject of its radical cure has exercised the ingenuity and talents of surgeons to a remarkable degree. Different methods of attempting to effect a radical cure of the inguinal variety have been suggested by as many as twenty-five operators, viz: Ferguson, Nielaton, Ombrednanne, Bernhardt, Deaver, Ball, Stinson, Landphere, Mayhean, Phillips, Czencney, Socin, Thomas, Schawtz, Barker, Martin, MacCuen, Bloodgood, Eccles, Beck, Fowler, Kocher, Halstead, Bassini and Benjamin. These gentlemen each recommend a different method of operating in hopes of achieving success.

Many of these operations still have their advocates; some are forgotten; others have fallen into disuse; a few are yet on trial. The many different methods of operating are still to be tested to prove that the proper method is thus far to be selected, procuring a fundamental cure; this depends on the

particular condition that each case presents, as well as the character of the tissue of the individual with whom the operator has to deal. As Eccles very aptly puts it: "An uniformity of procedure in suturing the canal implies that all inguinal hernias are alike and implies similar treatment, a fact that experience entirely and necessarily discredits, each case having to be dealt with on its own merits." This statement appears to us to be the keynote of the situation, and explains why a particular operation will not succeed in each instance, and hence the existence of so many different methods to effect a radical cure that are in vogue.

In spite of the fact that the profession is at variance as to the most suitable operation to be selected for the radical cure of hernia, accumulated evidence derived from a large number of different operations has narrowed the choice of methods adopted by the majority of surgeons in this country down to a few, which may be enumerated in order of their popularity, as the Bassini, Halstead, Kocher, Bloodgood and Fowler; the last named being still on trial. Each has its advocates; as has been already pointed out, none are probably suitable to every variety of inguinal protrusion. Frequently the surgeon must use his ingenuity and experience as a guide to the best method of procedure.

The popularity and confidence evinced by the profession, in the United States, for the Bassini operation are probably largely due to the writings of Bull and Coley, who published an article in the Annals of Surgery for 1898, in which it is demonstrated that attempts to effect a radical cure of inguinal hernia were disappointing until the Bassini method of operating, together with the employment of the absorbable suture, was adopted. The results of 1053 operations are tabulated, of which 522 were performed by Bull and 531 by Coley. Of this number 618 were performed by the Bassini method; among which there were but twelve relapses. Three hundred and seventy-one of the patients were children under 14 years of age; but three relapses occurred, giving a percentage of 75 per cent. Two hundred and seventy-four were adults, over 14 years of age, of whom nine cases recurred, making 3.7 per cent. Primary union took place in 95.5 per cent. In a new series of 917 cases, operated on since 1890, 480 were well a year after the performance of the operations. Two hundred and ninety-five were kept under cognizance and found free from recurrences for periods varying from three to seven years. The mortality in this series of operations was five deaths, or 4 per cent. Since

the reports of these cases, the mortality has continued to decrease, until to-day, in unstrangulated cases, where the individual has been in a physical condition to submit to a radical operation, the mortality is less than ½ per cent.

In the Medical Record for January, 1897, De Garmo gives the record of 250 Bassini operations for inguinal hernia; no deaths resulting. Two hundred and sixteen patients were operated upon; in 34 the operation being performed on both sides. The brilliant results obtained by Bull and Coley, by the Bassini method, together with the low mortality, which is in accord with the experience of numerous other surgeons, has had much to do with the popularity of this operation. From our own experience and from the knowledge gained from the study of the literature of the subject, we have learned to believe that the Bassini is the proper method to pursue for the radical cure of the majority of patients afflicted with inguinal hernia; but cases will arise from time to time where we must deviate from the directions suggested by Bassini and select some other means of operating in order to effect a cure. Where the conjoined tendon is either so attenuated or so obliterated that Hesselbach's triangle has lost its strongest support, transplantation of the rectus muscle is employed after the method suggested by Bloodgood (Bull. Johns Hopkins Hospital, May, 1891); the remainder of the operation is performed by the Bassini method.

Whilst some authorities still advocate aseptic silk and silver wire for the buried sutures when closing the various structures, the mass of clinical evidence is against their employment; the material of choice being kangaroo tendon, and chromicized catgut. Coley has noticed fourteen cases where sinuses with relapses of the hernia have followed the employment of the silver wire suture. Four similar cases have come under our observation. In 250 operations performed by Coley, where kangaroo tendon was used as buried sutures, in 96 per cent. primary union occurred, and in no instance was the healing attended by the formation of a sinus. (N. Y. Med. Journal, Feb. 29, 1896.) Attention is called to the fact that "a large proportion of cases of suppuration formerly attributed to catgut or imperfectly sterilized buried ally due to other causes, chiefly to infection by the tor of assistants; it is only necessary to compare healing before and after the use of rubber June, 1903.)

In 29 of our cases where a radical cure was attempted, whose after course could be traced, the results may be tabulated as follows:

18 indirect inguinal; Halstead one; Fowler one; and the remaining after the manner suggested by Bassini.

6 indirect inguinal hernia; strangulation existing at the time of operation. In these cases after relieving the constriction the Bassini or Bloodgood operation was performed.

1 indirect inguinal hernia; Bloodgood operation.

1 ventral hernia; following a celiotomy.

2 umbilical hernias; one the ordinary method, the other the Mayo operation.

1 femoral hernia; Bassini method.

Of the 18 cases of non-strangulated inguinal hernia, all have remained permanently cured for a period varying from one up to ten years, save in one instance, where a recurrence took place one and a half years after operation. In this instance the protrusion was large and had existed for several years, during which time a truss had been constantly worn. The case was one where a Bloodgood operation should have been performed. Unfortunately the radical cure was attempted before this method of operating had been suggested. Of the six cases where a radical cure was attempted at the time that the strangulation was relieved, one recurred in nine months, and another two years after operation, this patient being 73 years old when the herniotomy was performed; the hernial protrusion having existed fifteen years. In none of the remaining cases has recurrence taken place. Only six months, however, have elapsed since the operation for relief of femoral hernia was performed. Clinical evidence has shown that if a recurrence is likely to occur, it usually takes place within six months after the operation, and that the chances of recurrence are greatly diminished after one year.

The case of umbilical hernia operated upon after the method suggested by Mayo has been found to be the most satisfactory for the relief of this form that we have ever employed. It is nine months since the operation was performed, and up to this time the individual continues in excellent health; there is no tendency to recurrence. Nineteen successful operations by this method are reported by Mayo in the Annals of Surgery for August, 1901. Absorbable sutures were employed in all the operations, save in the one where a Halstead operation was employed, when silver wire was used for the buried sutures. After convalescence the wire occasionally gave rise to some local symptoms of irritation, and one year after the operation a sinus

formed leading down to one of the sutures, which it became necessary
to remove. In three similar cases, operated upon by different sur-
geons, we have been called upon to remove one or more of the buried
silver wire sutures which had been employd to close the canal. The
employment of the non-absorbable suture is not recommended.

In the cases where either a unilateral or bilateral hydrocele existed
as a complication, the hydrocele was partially resected in one, and in
the two remaining patients the Doyen method was adopted. All made
eventual recoveries. So far there has been no tendency to a recur-
rence of either the hernias or hydroceles. In the case of hydrocele of
the cord, the tumor was the size of a small orange, which was dissected
out in its entirety.

In the case of tuberculosis of the testicle, complicated with hernia,
it was found necessary to resect the entire vas deferens together with
the removal of the testicle. Two years have elapsed since the oper-
ation; so far there has been neither a return of the rupture nor any
evidence of further tubercular infection; it is true that the patient has
had the advantage of fortifying his constitution by a sojourn for a
year and a half in New Mexico.

In seven cases of undescended testicle, associated with inguinal
hernia, one was an iliac retention, the testicle being found in the iliac
fascia near the internal abdominal ring. In the remaining cases the
organ was located either in the inguinal canal or at the external ab-
dominal ring. In four of the cases the hernia had insinuated itself
beyond the retained testicle and had passed into the scrotum. In one
case the presence of the testicle prevented the protrusion of the bowel
beyond the external ring. In this case both the rupture and the tes-
ticle were found in the inguinal canal.

Authorities differ in opinion as to the efficiency of a misplaced tes-
ticle. Astley Cooper, Curling, Hunter and Grimths, from a study of
this condition in man and the lower animals, believe that an unde-
scended testicle fails to secrete fertilizing fluid. Should the condi-
tion be bilateral, the individual is frequently not only impotent but
sterile. On the other hand, Monod, Arthaud, Jacobson, ourselves
and others are convinced that in the early stage the testicle is still
functionally perfect; and that the danger of the organ becoming atro-
phied and functionless is less in the abdominal form of the retention
than it is in the inguinal variety.

the individual is under thirty years of age, and is strong and
ous, the chances are in his favor of not being sterile. If, how-

ever, he is effeminate, has a falsetto voice, small, undeveloped penis and absence of hair on the pubis, the condition being bilateral, the testicles having been the seat of repeated attacks of orchitis, the probabilities are that the patient is incapable of procreation. Provided the testicle was healthy, even if somewhat atrophied, it has been our custom to save it whenever it was possible to do so. On more than one occasion we have been gratified to find that the transplantation of an atrophied testicle has developed into almost its normal size when placed in its normal position. Many cases are on record where men with undescended testicles have married and succeeded in impregnating their wives. For this reason the individual should always have the benefit of the doubt; the sexual glands should not be sacrificed if possible; moreover, it is well known that the loss of one or both of the glands is frequently conducive to a great mental depression, and even melancholia. Dimitresco, after a careful study of the effect of castration (De l'Epididymectomy partielle ou total dans la tuberculose primitive du testicule. These de Paris, 1900. Trans. Soc. de Chir. Urin.) emphasizes the fact that teratology teaches that the testicle has a double function; that of a vascular gland as well as one of excretion. As White very tritely expresses it (White & Martin), the testicle has a twofold function: "The reproduction of the species and the development of the secondary characteristics of the individual." Physiologists have long since recognized the fact that the sexual glands secrete what is known as the "internal Testicular Secretion," the character of which is unknown, but is supposed, on being absorbed into the economy, to preserve the tone and vigor of the nervous system. In other words, the secretion serves to keep the individual in the normal groove. This is illustrated by the well-known physiological axiom that in individuals known to be incapable of producing spermatozoa retain all the characteristics of the male but are unable to procreate. (Griffiths, Lancet, March 30, 1895.)

Post-mortem examinations made by John Hunter, Goslin, Simon Tenon and others on men whose testicles were well developed, but in whom there existed a congenital absence of the vas deferens; it was found that though these individuals were known to be strong and sexually vigorous, yet they were sterile. Clinical experience has taught that resection of the epididymus and vasa deferentia in cases of diseased condition of those organs, the testicle retains its normal size; sexual vigor is unimpaired; the mentality of the patient remaining undisturbed. This observation places the testicle among the ductless

glands. From what has been said it would appear that one of the functions of the testicle is to elaborate a secretion, the absorption of which is of vital importance to the preserving of the normal condition of the nervous system. If this theory be true, the organ should never be sacrificed if there be a chance of its being preserved. In one instance, after freeing the adhesions of an undescended testicle it was found that on placing the organ in the scrotum the tension on the cord was very great. In order to relieve this condition the method suggested by Mr. Wood was adopted. The globus major was dissected free from the testicle, far enough down to permit of the organ being inverted. By this means one and a half inches in length was gained. After a testicle had been transplanted not only was it fastened by means of a suture to the bottom of the scrotum, but the cord was stitched to the pillows of the ring.

A brief history of the following case is of interest, as it may be classified as an accidental radical cure of inguinal hernia.

The patient was seen two years ago in consultation with Drs. Musser and Ott. He had a large reducible inguinal hernia on the right side, which had existed for eight years, for the relief of which he had worn a truss. Five days before he was first seen by us an acute attack of appendicitis had been developed, accompanied by the formation of an abscess. The rupture which had been reduced at the onset of the appendicitis began gradually to protrude, presenting all the symptoms of an inflamed hernia, being tense, painful and irreducible. It increased in size daily. There was nausea and vomiting, with high temperature, but the bowels moved regularly. On opening the appendicial abscess, it was found that the pus had burrowed down and had been discharged into the hernial sac, whilst the hernial outlet had become obliterated. Both the abdominal abscess, as well as the hernial sac were drained. Since recovery there has been no sign of recurring hernia.

Eleven cases were treated by what may be denominated the "palliative operation;" they were of long standing, with large hernias, enormous hernial outlets, and atrophied muscular abdominal walls. Eight were indirect, and three were direct inguinal hernias. Two had been incarcerated for a long time; three were partially so; and three were reducible, but the individuals were unable to retain the mass by any form of apparatus that was employed. Four were of large size, the remainder being of the dimensions of the average hernia. These individuals were annoyed by flatulence, eructations, constipation, occa-

sional nausea and colicky pains. In each instance the individuals were incapacitated for work, so that they necessarily became involuntary idlers and habitues of the out wards of the Philadelphia Hospital. In none of these cases was it presumed that the operation would result in a permanent cure. It was undertaken simply in order to relieve the symptoms and in hopes that after convalescence the individuals would be enabled to retain the intestinal protrusion by means of a properly applied truss. In each instance the result justified what might be regarded as an experimental operation; all were much improved, and all were enabled to retain the bowels by means of a suitable apparatus.

In cases of this description the surgeon cannot follow the fixed rules laid down for any recognized operation; he must utilize his experience and judgment with such available resources as he may have at command. In two cases where the rings were large and the conjoined tendon weak or absent, the Bloodgood method was adopted. For the closure of enormous hernial outlets, with large protrusion associated with an atrophied condition of the muscular structure; cases hitherto considered as inoperative, Witzel suggested the closure of these large apertures by means of buried silver netting (Centralblatt fur Chir., March 10, 1900.) Gopel reports eleven umbilical and seven inguinal hernias operated upon by this method, with but two failures. In an article in the Annals of Surgery for November, 1902, Willy Meyer strongly advocates the employment of the silver filigree in cases of the kind, and reports three successful operations. He calls attention to the fact, which is insisted upon by Witzel, and emphasized by Phelps, that even in those instances where the wound becomes infected and suppuration supervenes that the filigree pad should be kept intact. In event of the wound becoming infected it has been suggested that the sinus be enlarged sufficiently to permit a curette to be employed, after which the wound should be filled with pure carbolic acid, which is to be washed out with alcohol.

In spite of the apparently favorable results obtained, in the few reported cases, we cannot help feeling skeptical as to the value of the procedure, and are inclined to believe that a more extended experience with this method of attempting to close large hernial outlets, will prove unsatisfactory. As has already been pointed out, the employment of the buried silver suture, from the use of which so much was expected, when first introduced to the notice of the profession, has not come up to the expectations, and has in consequence been aban-

doned by the majority of surgeons.   We can see no reason why, there-
fore, the employment of silver netting, filigree, or allied devices,
should not meet with a similar fate.   Nevertheless, this method of
attempting to relieve what was hitherto supposed to be an inoperative
condition is still on trial.   It certainly merits the careful study and
serious consideration of the profession.   The gratifying results ob-
tained in the few cases that have been reported are most encouraging,
and it is hoped that a more extended experience with this mode of
treating cases of the kind will result in demonstrating that a large
number of these unfortunate sufferers who are now condemned to a
life of pain and misery may be capable of being relieved.

In each case of the kind operated upon by us, a different method
was employed.   Eccles calls attention to the fact that in many cases
where large hernias have been operated on, and their contents re-
stored to the abdominal cavity, that a hernia is apt to make its appear-
ance at one of the other outlets.   Fortunately this has not occurred in
any of the cases under consideration.   It is claimed that in hernias of
enormous size, or of long standing, especially if the sac contains an
unusual amount of bowel and omentum, with some one of the solid
viscera, such as the uterus or liver, that the abdominal cavity becomes
contracted, when necessarily the hernial protrusion cannot be restored.
As Petit aptly expresses it: "The protrusion has forfeited its right of
domicile."   This condition must be very rare, as shown by reference
to the literature on the subject, where it will be found that hernias of
enormous size have been successfully restored to the abdominal cavity
even after they have been protruded for years.   Among recent reports
of cases of the kind we find one which was relieved by operation re-
counted by Robison in the Practitioner for October, 1895.   The pa-
tient was 62 years of age, six feet in height, and the tumor reached
to his knees.   In the Philadelphia Medical Journal for February, 1901,
F. T. Stewart reports a successful operation on an enormous ventral
hernia, which contained half the stomach, all of the transverse colon,
the omentum, and most of the small intestines.   A somewhat similar
case, as regards size, is reported in the Annals of Surgery, 1899, by
Da Costa.   Both cases were operated on successfully.   Two cases
of unusually large hernia are reported by Keen in the American Text-
book of Surgery.   The study of these few selected cases, out of the
many that might be cited, seems to show that there is but little fear
but that the ability of the operator will enable him to restore the con-
tents of a large hernia to the abdominal cavity; yet it is not uncom-

mon to hear surgeons say that the hernia is too large or has existed too long to permit the contents to be restored to the abdominal cavity.

In our judgment, in selected cases of long standing incarcerated hernias and those that are reducible, but cannot be retained by the employment of a truss, the chance of relief should be attempted, and comfort afforded by a palliative operation. Not with the hope of making a permanent cure, but to relieve the distressing symptoms which naturally accompany such a condition, an effort should be made to retain the rupture by means of a suitable apparatus. We are convinced that too many surgeons give too little attention to the selection of a suitable truss for non-operative cases. As a rule, the patient is sent to a trussmaker, who applies the variety of instrument that in his judgment is best suited for the case. It is true that the average truss sold by instrument makers will usually serve to retain the ordinary hernias. Occasionally the truss does not hold the protrusion in place, when the patient is told that it is impossible to retain the rupture by means of an apparatus. A careful study of the cause which prevents the truss from being satisfactory, together with the anatomical peculiarities which exist in each instance, will result, in the earlier stages of reducible hernias, in keeping them satisfactorily in place by the use of a suitable device. The truth of this assertion was forcibly brought to our notice by a patient under our care who had been repeatedly fitted with trusses both in this city and in New York, and without success. Whilst residing in a little country village during the summer months, a harnessmaker devised for him an apparatus consisting of pads and straps, which not only retained the rupture satisfactorily, but from which he has experienced no discomfort.

It is generally conceded that age makes but little difference in the mortality when operating on strangulated hernias, provided the constriction is relieved without using taxis inordinately, before resorting to operation. The extremes of life seem to bear the operation well. Audion (Pres. Méd., Dec. 30, 1899) exhibited before the Paris Society of Obstetrics a child that had been successfully operated on for the relief of a strangulated hernia one hour after birth.

O'Callaghan (Provincial Med. Journal, June 1, 1895) claims that those aged individuals whose only infirmities are those incidental to advanced years bear critical operations better than the majority of middle-aged people. This condition, he claims, applies especially to women. He recites three cases of successful operations in very old people. This is in accordance with our own experience. As one of

the surgeons to the Philadelphia Hospital, we are constantly called upon to operate upon very old people affected with strangulated hernia. The prognosis is favorable if there is no marked organic disease, the physical condition of the individual being merely that of senility and the operation being performed very shortly after hernia has occurred. If the opportunity for performing herniotomy has been delayed and prolonged and violent taxis has been employed, the majority of patients die either from exhaustion or peritonitis. In the cases under consideration, the youngest was fourteen and the oldest seventy-eight years of age. In the latter case not only was herniotomy performed for the relief of a strangulation, but a radical cure was attempted as well. Two years elapsed before a recurrence took place.

Regarding the age when a radical operation can be performed for the relief of hernia with the greatest certainty of a favorable result, the views advanced by Coley have been generally accepted in this country, the most favorable period being about the sixth year. In the adult without good cause it is not well to attempt a radical cure after sixty, and not then in very large and incarcerated hernias.

Coley teaches that if after an operation a recurrence is liable to take place, it usually does so within six months, and that if the patient remains in a healthful condition for one year it is usually safe to predict that recurrence will not take place. In three cases we have had a recurrence after two years. We believe in the main that Coley's views are correct.

There is a certain class of patients subject to hernia who are unfit for a radical or palliative operation unless the protrusion becomes strangulated, when the danger is greatly increased, but of course the individual must be allowed to take his chances. Unsuitable cases for either a radical or a palliative operation are the obese, in whom the abdominal wall bulges far forward; persons who suffer from any disease of the viscera, and those who have an incarcerated hernia of enormous size and long standing. Those who necessarily wear a truss after an operation are individuals who suffer from a direct inguinal hernia; those in whom an infection of the wound has taken place after an operation; all operations which might be classed under the head of palliative; in old hernias of long standing; in individuals who have to earn their livelihood by hard labor; in emergency herniotomy where the patient's condition would not warrant the employment of the length of time required to do a radical operation; and in children in

whom it was found that the hernial ring was unusually large. According to Eccles those who have a poorly developed muscular abdominal wall and a family history of tendency to hernia should always wear a properly fitting truss after undergoing an operation.

From a study of the cases recited in this paper the following conclusions may seem to be warranted:

1st. The safety of the patient, as well as the lowering of the mortality in strangulated hernia depends on gentle taxis being exerted for a short period, which if unsuccessful, should be succeeded by an immediate operation.

2d. Herniotomy for the relief of strangulated hernia in the aged is not a dangerous operation, provided it is performed as soon after the constriction has taken place as possible.

3d. An inflamed hernia should not be treated by taxis, but should be subjected to an operation.

4th. No one method of attempted radical cure is applicable to every variety of rupture. The Bassini is suitable to the largest majority. The Bloodgood for those in whom a large abdominal ring and weak or atrophied conjoined tendons exist. The relief of special forms and conditions of hernia must be met by the ingenuity of the surgeon, selecting the operation best suited to the indications presented.

5th. The palliative operation is applicable to a large number of selected cases of reducible hernia where the protrusion cannot be kept within the abdominal cavity by means of a truss, and also in some forms of incarcerated hernia.

6th. A radical cure may be safely attempted on patients who have reached their sixth year and on those who have arrived at their sixtieth year.

7th. Individuals who submit to what is known as the "Palliative Operation" should continue to wear trusses after recovery.

8th. In cases not applicable to a routine method of operation, the surgeon should strive to do what in his judgment would be the best means of effecting the removal of the entire neck of the sac on a level with the parietal peritoneum; he should, if possible, firmly close the opening in the peritoneum after the removal of the sac; he should obliterate the depression of the peritoneum in the vicinity of the internal abdominal ring, bring in apposition the structures, and close the apertures which form the canal through which the rupture protrudes.

9th. An aseptic result following a radical operation, with primary union, is essential to obtain a permanent cure of hernia.

10th.   In cases of undescended testicle, associated with hernia, every effort should be made to save and transplant the organ.

11th.   The method of operating for umbilical hernia suggested by Mayo is probably the most satisfactory for that variety hitherto suggested.

12th.   Absorbable sutures are preferable to those of non-absorbable material.

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THE GROSS APPEARANCE OF THE TISSUES OF THE IRIS IN EPILEPSY.*

By CHARLES A. OLIVER, A. M., M. D.,
and
JAY C. KNIPE, M. D.

The material for these studies was obtained from the Nervous Wards of the Institution (January, February and March of the year ing the writers' last three months' terms of service, in the Ophthalmic Wards of the Institution (January, February and March of the year 1904).

Every case was submitted to a critical ophthalmic examination in order that all local ocular disease might be excluded. Nearly sixty subjects, males as a rule, and preferably native born American adults, were used. Each eye was examined in every relevant detail. Notes of all of the findings were taken at the time, and later compiled as a whole without any regard to the character of the results. Diffuse daylight was concentrated upon the magnified tissues of the membrane in such a way that thorough study could be made of every exposed portion.

As a result it was found:

First. That the pupils, like those of normal individuals, were oval or ovoid, with the angles of their long axes placed slightly downward and outward.

Second. The pupils as a rule were unequal in size, that of the left eye being generally the larger.

Third. The pupillary rims of the pupillary zones presented unusual degrees of uveal pigment fringing.

Fourth. The muscle areas of the pupillary zones were, as a whole, rather deeply tinted, and the composite fibres appeared to be slightly thickened.

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*The writers' attention was first attracted to this subject several years ago, while reading Dr. William Browning's positive findings in his most interesting article upon "Inequality of the Pupils in Epileptics, with a Note on Latent Anisocoria," which appeared in the Journal of Nervous and Mental Diseases for January, 1892 (p. 17).

Fifth. The divisional minor circles were not distinctly outlined, their interlacings and crypts in most instances not being sharply and clearly defined.

Sixth. The radiary fibres of the ciliary zone were plainly marked and outlined, although the intervening minute depressions were blurred and indistinct in some places.

Seventh. The concentric contraction grooves in the ciliary zones were abruptly broken in places, with a lessening of the indentation depths, and an undue broadening and elevation of the corresponding furrow ridges.

Eighth. The vascular spots and pigment aggregations ordinarily seen in the ciliary zone were probably increased in number and size.

Ninth. The peripheral pigment in the generally invisible ciliary rim of the ciliary zone was sufficiently broadened in some situations in some cases that it could be seen under oblique illumination.

A CASE OF UNIVERSAL CONGENITAL ATRICHIA.

By AUGUSTUS A. ESHNER, M. D.

The unique case I am about to report is one of total absence of the hair from all parts of the body, existing, so far as could be learned, from birth. If the history as given by the patient is correct the condition cannot, strictly speaking, be regarded as one of alopeca or baldness, that is loss of hair, but rather as one of atrichia, namely failure on the part of the hair to develop. The universal distribution of the disorder is not the least remarkable feature. In addition the nails presented significant changes, and there was present, besides, the rare anomaly of retinitis albicans.

The patient was a house painter, 64 years old, who was admitted to the Philadelphia General Hospital on January 2, 1904, complaining of pains throughout the body, especially in the lumbo-sacral region. He presented slight swelling of both lower extremities and drooping of the right upper eyelid, with inability to elevate the lid properly. The action of the heart was arrhythmic, but the sounds were clear. The especially noteworthy feature about the patient was the total absence of hair from all parts of the body, a condition that, according to the patient's repeated statement, had existed from birth. The skin itself was soft, smooth and unctuous. The man related further that he perspired but little. The nails of the fingers and toes were only about one-half the normal length, and their distal extremities were irregular and longitudinally rugous. The patient stated that they had presented this appearance from birth, and that he never trimmed them. He had only three teeth in the lower jaw and none in the upper; the others had gradually fallen out in the progress of time. The urine was free from albumin and sugar. Dr. C. A. Oliver kindly examined the eyes and confirmed the absence of lashes. In addition he found the condition of retinitis albicans, characterized by the presence of numerous mosaics and areas of whitish masses, with exposure of the underlying sclerotic. So far as the patient knew, no other member of his family exhibited like absence of hair or alteration in the nails.

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He gave a personal history of gonorrhœa and of lead poisoning; there was some doubt as to syphilis.

Whether the absence of hair in this case had really existed from birth, as the patient maintained, cannot, of course, be established with certainty, as we have only his unconfirmed statement to this effect. In any event, the condition, whether one of generalized loss of hair or one of generalized failure on the part of the hair to develop, is exceedingly rare. In fact, I have been able to find records of only a few similar cases and to some of these the references are exceedingly brief and in some instances indefinite.

F. G. Danz[1] refers briefly to two grown brothers who had always presented entire deficiency of both teeth and hair.

Steimnig* reports the cases of a boy, 3½ years old, and his sister, 1 year old, whose bodies at birth were devoid of hair and covered only with vernix caseosa. Nowhere on the head was there even a trace of lanugo, and eyebrows and eyelashes alike were absent. The nails of the fingers and toes were only indicated, appearing as shrunken or shriveled points. The children sweated freely, especially about the head. The parents were healthy and had each a strong growth of hair.

John F. South* in a translation of Adolph Wilhelm Otto's Compendium of Human and Comparative Pathological Anatomy refers to the case of a man aged twenty who had no hair on his head, eyebrows, eyelids and chin, and was said to have none on the pubes.

Burkard Eble§ cites Laurent Heister¶ as speaking of two individuals that had no hair on the entire body, and as having seen a man, about 40 years of age, and otherwise well, who some ten years previously had, without recognizable disease, lost all of his hair, including the eyebrows and eyelashes, so that no trace could be discovered, and also a woman who without antecedent disease had lost all of her hair. He refers to observations of individuals without hair or teeth recorded in the Transactions of a Society of London for 1800 and the Salzburger Medicinisch-Chirurgische Zeitung for 1801, i, p. 250;

Stark's Archiv für die Geburtshülfe, Frauenzimmer- und Neugebohrner Kinderkrankheiten, iv. H., 3. Stück, Jena, 1792, p. 684.

*Notizen aus dem Gebiete der Natur- and Heilkunde, No. 4, xxvi. B., Nov., 1829, No. 554, p. 50.

*London, 1831, p. 120.

§Die Lehre von den Haaren in der gesammten organischen Natur, 2. B., Vienna, 1831, p. 244.

¶Medicin., chirurgische und anatomische Wahrnehmungen, Rostock, 1753;

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quotes Schenk as authority for the statement that King Louis of Hungary was born without hair; cites the observation by Dr. Wells* of similar complete absence of hair, by H. F. Delius of an individual without even the smallest hair upon the body and by Augustin† of a man on whose body no trace of hair could be observed, and speaks of a similar case mentioned by Leveling.‡

M. Schede§ has reported the cases of a brother and sister, aged 13 years and 6 months respectively, who were hairless at birth and continued to be so up to the time of observation, when no trace of hair could be discovered on any part of the body. The parents and two other children intermediate in age were healthy and exhibited a full growth of hair. A piece of scalp was excised from the head of the elder of the children in question, and well-developed sebaceous glands were found opening on the surface, while at their base were sebaceous cells having distinct nuclei and fragmented contents. Nearer the orifice the cells formed irregular sebaceous masses. Close by were a large number of small and large atheromas separated from the glands by connective tissue, evidently developed from glandular tubes. All of the latter, however, were not distended or degenerated. In places they were short and straight or slightly convoluted, and not always provided with a lumen. They were filled with cells arranged in two layers, an outer, consisting of long, narrow cylinders with rod-shaped nuclei, and an inner, consisting of small round or polygonal cells. These were looked upon as rudimentary hair-follicles. The sweat-glands were normally developed. The erector muscles of the hair were well developed, but there was no sign of hair.

Dr. J. Higham Bell¶ refers to an aboriginal black man and woman, brother and sister, said to be entirely devoid of hair, a sister of whom, similarly hairless, had died a few years before, and who had when young been brought to a station in Australia in the same hairless state. They were thought to belong to a tribe of hairless Australian blacks. Photographs represented a well-formed and well-developed man and woman of middle age, without a particle of hair

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*Transactions of a Society for the Improvement of Medical and Surgical Knowledge, ii, 1800.

†Asklepieion, March, 1812, 3. H.

‡Haller's Grundriss der Physiologie, Erlangen, 1795, 8, i. Theil, Note 325, p. 384.

§ M. Schede: Archiv für klinische Chirurgie, xvi, 1872, p. 158.

¶British Medical Journal, January 29, 1881, p. 177.

visible on their heads and bodies, and none was found on most care-
ful inspection. The peculiarity is especially striking, as the Australian
aboriginals are naturally a hairy race.

In a paper on so-called dog-men Alexander Brandt§ refers to a Rus-
sian peasant with absolute congenital atrichia mentioned by one of his
students. He points out that the fetal lanugo may either fall out and
not be replaced by permanent hair or be excessive and persistent and
give rise to the condition of abnormal hairiness.

An additional number of cases have been reported in which there
has been temporary or transitory absence or loss of hair, generalized
or local, natal or post-natal, often in conjunction with abnormal con-
ditions of the nails and the teeth, and sometimes with deficiency or
total absence of perspiration, in one instance with absence of the se-
cretion of tears, and in one with absence of the mammary glands; fre-
quently there is a faminal distribution.

Rayer* reports the case of a man whose cranium appeared en-
tirely naked, although on close examination a quantity of fine, silky,
white down was found present. There were also a few black specks
on the temples representing stumps of hairs that had been shaved off.
The eyebrows were indicated by fine, short hairs. The edges of the
lids were without lashes, but the bulb of each of these was indicated by
a small whitish point. The beard was thin and weak. There were a
few straggling hairs on the breast and pubic region, and scarcely any
in the axillæ. Hair was more abundant on the inner aspect of the legs.
The father of the patient presented a similar defect.

John Thurnam¶ has reported two cases in cousins exhibiting im-
perfect development of skin, hair and teeth. One occurred in a man
who died at the age of 58 years, and was during life almost com-
pletely without hair. He had only four teeth. There was a small
amount of fine hair on the head and face, in the axillæ and on the
pubes. The eyebrows were absent and the lashes were defective. The
skin generally was fine, thin and delicate, and its surface was often
dry and harsh, without traces of sensible perspiration and any trace of
unctuosity. Sudorifics made the skin soft and relaxed, but had no
effect upon its state of moisture. A trace of fluid appeared upon the

§Biologisches Centralblatt, March 1, 1897, xvii, 5, p. 161.

*A Theoretical and Practical Treatise on the Diseases of the Skin, 2d edi-
tion.

¶Translated by R. Willis, London, 1835, p. 1049.

¶Medico-Chirurgical Transactions, xxxi, 1848, p. 71.

surface in the last week or ten days of life. There was, further, an absence of tears. After death the skin was found in a condition of atrophy and atony, and the suboriparous apparatus defective. The second case was in a maternal cousin, who exhibited almost precisely the same peculiarity, the head being equally bald, the skin similarly delicate in structure, the sensible perspiration and tears likewise absent and the teeth also deficient. The maternal grandmother exhibited extreme delicacy of the skin, with a limited amount of sensible perspiration.

In discussing Thurnam's case Williams* referred to the case of a young lady, 15 years old, described as being devoid of hair and teeth, but found to be not entirely so. The hair was fine, scanty and white, although there was scarcely any forming the brows and lashes. The patient had three or four projections resembling teeth, and these were carious. She had never perspired and menstruation had not yet set in.

William Sedgwick§ cites the case, reported by T. H. Burgess, of a boy, 8 years old, who was without a vestige of hair on the scalp, devoid of eyebrows and eyelashes, and without hair on any part of the body. He had the usual supply of hair until the age of 4 years, when it began to fall out gradually, until it had disappeared entirely. The brother of this boy, two years younger, had begun to lose his hair in detached places. His sisters, younger and older, had a good supply of hair, as had also the parents.

N. MacNaughton Jones and Ringrose Atkins¶ describe the microscopic appearances in a case of so-called congenital alopecia. The patient was a boy under treatment for his eyes, who had no recollection of ever having had any hair on his scalp, although he had heard during youth of the presence of some downy hairs. The face was the only part of the body on which there was any appearance of hair, and here there was a fine down. The finger nails were aborted and badly formed, with ridges and furrows. The teeth were irregular, far apart and marked by transverse ridges and discoloration. Histologic examination of sections of the scalp disclosed the presence of irregular tubules, crossed by fine trabeculæ and containing granular material, and also in places an aggregation of circular and ovoid apertures deeply lined with small and compressed epidermic cells. These aper-

*London Medical Gazette, vi, 1848, p. 336.
§British Foreign Medico-Chirurgical Review, xxxi, 1863, p. 445.
¶Dublin Journal of Medical Science, ix, 1875, p. 200.

tures appeared to be transverse sections of tubular cylinders, and these were thought to represent hair follicles altered in situation, position and structure. Here and there was an aborted hair follicle, forming a shallow pit in the epidermic layer, and lined by a layer of similar cells, the open extremity looking downward.

J. B. Luce* reports the case of a girl, 8½ years old, who was said to have been entirely bald at birth. In the sixth month a number of small elevations appeared on the scalp, and the first hairs were observed at the age of six years. At 8½ numerous lanugo hairs were present, and also a little blackish-gray hair. The scalp was the seat of conical nodules, the skin over which presented a normal color, with a central dark point. Introduction of a needle into such a nodule permitted the escape of a rolled-up hair.

Paul Michelson§ cites the case of a girl 2 years old, otherwise normal, whose head was sparsely covered with lanugo.

S. H. Guilford,† of Philadelphia, describes the case of a man, 48 years old, edentulous from birth, who exhibited absence of the sense of smell, almost complete absence of the sense of taste, absence of sweating and of hair from the trunk, with an excess of hair on the face, in the axillæ and in the pubic region, while the head was covered with soft down. His maternal grandmother had never had hair or teeth, while his mother was normal in these respects. A brother of the latter also was without teeth and hair. Of her 21 children 18 were living, but the patient was the only one without teeth, although in some certain teeth had failed to make their appearance. The patient himself had eight children, several of whom were in some degree edentulous, although otherwise normal.

Jonathan Hutchinson¶ has reported a case of congenital absence of the hair and the mammary glands in a boy, 3½ years old. The head, however, was covered by a quantity of down, and the teeth were normal. The nails of the fingers and toes were thin and curved backward, presenting a depression in the middle. The nipples were replaced by cicatricial patches, but there was no trace of the mammary glands.

The mother had from the age of six to the time of the report suffered a gradual loss of hair from alopecia areata. At first the scalp

*These de Paris, No. 579, 1870; Schmidt's Jahrbücher, P. 191, H. 1 p. 31.
§Handbuch der Hautkrankheiten in Ziemssen's Handbuch der speciellen Pathologie und Therapie. Leipsic, 1883, p. 107.
†Wiener medizinische Wochenschrift. No. 37, 1883, p. 1116.
¶Medico-Chirurgical Transactions, vii, 1886, p. 473.

became bald and smooth; subsequently the eyebrows and eyelashes fell out. The latter grew again, and a few tufts of hair appeared on the scalp.

This case has been more recently described by Hastings Gilford[†] as one of progeria or premature senility. The patient was at this time 15½ years old. On close inspection a feeble growth of hair was found on the backs of the hands and wrists and on the head. The teeth were of good size and in fair condition. In another case reported by Guilford[*] the patient was a boy, 18 years old, whose eyebrows and eyelids at first appeared devoid of hair, but on close inspection a few scattered and downy hairs were discovered in both situations. A small number were detected also on the backs of the hands and wrists. None, however, could be found upon any other part of the body. The nails of the fingers and toes were short, ill-shaped and membranous.

Paul de Molènes[§] reports the case of a girl, 4½ years old, who at birth presented an almost imperceptible down on the scalp, scarcely developed eyelashes and normal nails, with an absence of eyebrows. At the age of five months the eyelashes fell out, and at the age of sixteen months the entire hairy system was deficient. On the scalp no down was visible, even with the aid of a lens, although numerous orifices were present, indicative of the integrity of the pilo-sebaceous organs. A fine white down was discernible on the lower lids with the aid of a lens. The nails and teeth were normal. Under treatment slow and gradual growth of hairs took place in various situations. Hairs and follicles were found normal on microscopic examination. The mother of the patient had been treated for extensive alopecia areata at the age of nineteen years, and a brother at the age of six years.

Molènes state that the condition of atrichia is exceedingly rare and almost never absolute. Generally a fine down is present, indicating the existence of hair-follicles. Usually also the anomaly is partial. It may persist for several months after birth, and even up to the second year. Few examples are known in which it persisted throughout life. Molènes considered it a perversion of function or an arrest of development affecting the organ giving rise to the hair.

Two cases of congenital familial alopecia were exhibited at the meeting of the Société Francaise de Dermatologie et de Syphilographie,

†Practitioner, August, 1904.
*Ibidem.
§Annales de Dermatologie et de Syphilographie, 1890, i. p. 548.

held November 10, 1892. The condition could not have been complete, as the statement is made that the hair was the seat of a garland-like malformation.*

Aubry† reports a case of congenital alopecia in a young man, 16 years old, in which the loss of hair followed in a general way the lines of the cranial sutures, the remainder of the head being covered with a dense layer of black hair. The condition was thought to be due to atrophy of the skin from stretching in consequence of hydrocephalus. The teeth were normal.

At a meeting of the New York Dermatological Society, held November 27, 1894, J. A. Fordyce‡ presented a girl, 4 years old, with complete alopecia. A few hairs were noticed at birth, but these soon fell out. A few scattered eyelashes were present. There was no family history of alopecia.

P. S. Abraham§ reports three cases of congenital alopecia in a mother and her two children. The former, aged 33 years, exhibited complete absence of hair from the eyebrows, eyelids, arms, legs, trunk, with a scanty supply on the scalp, pubes and axillæ. At birth there was a small fluff on the head, but this soon fell out. The absence of hair remained complete until the age of 18 years, when hair gradually made its appearance on the scalp, in the axillæ and on the pubes. Of the children, one aged five years was in a state of almost complete alopecia. There was a little down on the head at birth, but this fell out at the age of three months. The second child, 15 months old, likewise appeared to be completely without hair. It had black hair at birth, but this fell out at the age of three months.

C. Nicolle and A. Halipré¶ have described a condition of deficiency of the hair with trophic changes in the nails occurring in 36 members of one family during six generations. They report at some length the case of a young man, 18 years old, deficient mentally, whose eyebrows were scanty and unpigmented, the lashes white, the hair on the scalp thin and in places lighter in color than elsewhere. There was no hair on the anterior aspect of the chest, only a few short white hairs in the axillæ, no mammary hair, and a moderate amount of long brown hair on the pubes. The teeth were normal. The terminal phalanx of each finger was larger than normal, edema-

*Monatshefte für praktische Dermatologie, 1896, ii, p. 618.
†Annales de Dermatologie et de Syphilographie, 3. ser., iv, 1893, p. 899.
‡Journal of Cutaneous and Genito-Urinary Diseases, xiii, p. 120.
§British Journal of Dermatology, vii, 1895, p. 162.
¶Annales de Dermatologie et de Syphilagraphie, 3. ser., vi, 1895, p. 804.

tous and red, while the nails were in varying degree hypertrophied, longer and thicker than normal, rugous and scaly, with a tendency to become elevated and incurvated at the extremity. The majority exhibited exaggeration of the longitudinal striation and some were striated transversely. They were extremely friable, some being cracked in the middle and others longitudinally. Some were separated and tended to become detached. The free border was in general black, the rest of the nail grayish yellow. The extremities of most of the fingers about and beneath the nails were the seat of ulceration.

A case of similar character is reported by Charles J. White.* This occurred in a young man, 19 years old, who presented an abundant uniform growth of pale, short, downy hair on the scalp, with an absence of hairs from the cheeks, the chin and the axillæ. The eyelids and eyebrows were normal, the hair on the upper lip of the lanugo type, and a few hairs were present on the pubes. From the age of nine, following an injury to two of the fingers of one hand, the bed of the nails of all of the fingers and toes were from time to time the seat of ulceration, the nails becoming thickened and broken and discolored at the extremities. Staphylococcus pyogenes aureus and streptococcus pyogenes were obtained on culture. The hairs presented a normal apearance. The great-grandfather of the patient had had little hair, and the nails of his fingers and toes were faulty in development. The second generation escaped. The third generation comprised eight children, six sons and two daughters, of whom one son and two daughters were affected—the mother and two uncles of the patient. The former had always had but little hair, and the fingernails had for years been thickened and abnormal. The uncles had had normal hair, but the nails were bad. One of the uncles married and had two children, a son of nine and a daughter of four. The latter was born without hair or nails, and these failed to develop. The patient had one sister, two step-brothers and one step-sister. The sister had a thick, downy head of hair, the individual hairs being blond and short.

Paul Ziegler§ has reported the case of a girl, 17 years old, who was hairless at birth, though otherwise normal. She was the youngest of eleven children, all of whom but her presented no abnormality. There was no family history of aberrant growth of hair. From the age of 13 a small bunch of black hair made its appearance every four

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*Journal of Cutaneous and Genito-Urinary Diseases, xiv, 1896, p. 220.
§Archiv für Dermatologie und Syphilis, Vol. xxxix, 1807, p. 213.

weeks at the occipital protuberance, disappearing in the course of four days with the cessation of menstruation. From the same period also there had been a small amount of down on the cheeks. A year previously a few hairs of normal appearance had developed on the eyebrows and eyelids. Recently the patient had noticed fine hair on the forearms. The teeth and nails exhibited no peculiarity. The arms, shoulders and thighs were the seat of lichen pilaris. On microscopic examination of a bit of skin removed from the scalp the epithelium and the sebaceous glands were found normally developed, with numerous papillæ, but with an absence of hairs. Near the sebaceous glands, generally at their bases, at a distance from the surface epithelium, were isolated convoluted epithelial tubes, with a large, generally circular lumen and not communicating with the surface. These were lined with from four to six layers of cells, and they were surrounded by connective tissue, near which were unstriped muscular fibers, erectors of the hairs. Similar fibers were present also in the vicinity of the sweat-glands, which themselves were normal in every respect. The epithelial tubes were thought to represent the remains of the external sheath of the root of the hair.

Ziegler ascribes the failure of the hair to develop to local alterations in the external sheath of the root of the hair below the level of the excretory duct of the sebaceous gland. He thinks excessive production of the cells of the sebaceous duct may cause occlusion of the lower portion of the sheath of the root of the hair, resulting in a constriction off of the lowermost portion of the sheath before the papilla has formed. In some instances he believes there may be delayed growth of otherwise normal hair.

Felix Pinkus* has reported the case of a boy, 8 years old, who at birth had a growth of hair on the head, especially on the posterior portion. The forehead was bald, but it was not known if there was any hair on the body. At the age of a few months a deposit of crusts formed on the vertex, and this was followed by loss of the hair. The child was quite bald at the age of nine months, and thereafter only a few hairs grew. The body was at this time almost hairless. A year later there were only a few short hairs at the root of the penis, and only a few on the back from the neck to the buttocks. There was scarcely any hair on the arms and the legs. The face was the seat of abundant lanugo, with a few stray hairs on the forehead and the cheeks, while the lobule of the ear and the tragus were well supplied.

*Archiv fur Dermatologie und Syphilis, 50, B., 1899, p. 347.

with hair. The eyelashes were well developed, while the eyebrows were deficient. On the head the hair was scanty, irregularly distributed and short, though requiring cutting from time to time. The hairs were thin, dark and twisted. The nails were thin, flat, unduly white and friable at the edges, and their surface was covered with bands, converging to the tips of the fingers. The teeth were in process of change and some had been extracted. The second premolars were wanting, as well as the left lower canine and both outer upper incisors.

Pinkus employs the term hypotrichosis to designate the condition present in his case, contending that the pathological state does not consist in a loss of hair, but rather in deficient growth, the failure occurring at the time when the lanugo or deciduous hair ordinarily is replaced by the permanent hair. The affection would thus be a developmental defect and not properly a disease.

M. Radcliffe Crocker* refers to the case of a girl four years old, born without hair or nails. The latter began to grow abnormally within a week, the former not for three years. In addition, there was atrophy of the skin generally.

*Diseases of the Skin: P. Blakiston's Son & Co., 1903.

OLD IRREDUCIBLE INGUINAL HERNIA; INCARCERATION; HERNIOTOMY; INTESTINAL RESECTION; END-TO-END SUTURE; RECOVERY.

By Alfred C. Wood, M. D.

The following case illustrates some of the difficulties encountered both in the diagnosis and operative treatment of hernias:

A thin, poorly-nourished colored man, laborer, 53 years of age, was brought to the Philadelphia General Hospital with the following history: About twelve years ago he first observed a rupture in the left inguinal region. He had never worn a truss, as the hernia gave him no inconvenience, although it gradually increased in size. Following a dietetic error, two weeks before admission, the patient had epigastric pain, vomiting and diarrhea. The scrotum began to enlarge and became painful. The diarrhea was followed by constipation. The abdominal pain and vomiting continued.

The tongue was coated. Examination of the chest was negative. The abdomen was slightly distended, moderately tense, and there was slight general tenderness. The left side of the scrotum was much enlarged, but not painful. The scrotal swelling was uniformly hard, and was wholly irreducible. It gave a slight, indistinct impulse on coughing. The upper part of the swelling gave a resonant note on percussion, while the lower part was quite dull. It did not transmit light at any part.

Examination of the patient's urine showed the presence of albumin, and hyaline, epithelial and granular casts.

The diagnosis presented some difficulties. There was undoubtedly a hernia present, but whether the sudden and considerable increase in size that occurred two weeks before admission was due to fluid, omentum or a tumor of the testis, was not so clear. There was evidently but a small amount of intestine within the scrotum. The presence of fluid could not positively be excluded. Although the light test was negative, the patient being a full-blooded negro, the skin was so black that translucency could not have been observed even if the sac con-

tained fluid. Moreover, the patient himself was convinced that there
was a growth connected with the testis. Furthermore, from the his-
tory, it was uncertain whether the continued vomiting was due to the
so-called "dietary indiscretion" or to other causes, and finally, positive
evidences of strangulation were lacking.

However, as the symptoms showed no sign of ameliorating, it was
thought proper to operate on the hernia, and deal with whatever condi-
tions might be found; realizing, of course, the increased risk of anes-
thesia in a patient the subject of well-marked nephritis.

The operation was performed September 15, 1903. An incision was
begun over the internal ring and carried over the canal and along the
scrotum in the long axis of the swelling. The tissues were incised
cautiously, but the different layers had become so blended that their
recognition was impossible. Finally, the sac was opened, a small quan-
tity of fluid escaped, and a mass of omentum was encountered. This
proved to be but a part of the swelling, however, and on continuing
the dissection another collection of fluid was evacuated and some loops
of small intestine were exposed. It was soon apparent that the entire
swelling was a hernia, with only a small amount of intestine, but with
a large amount of omentum and fluid. The hernial sac had become
separated by adhesions into three or four separate cavities, a condition
so often observed in old umbilical hernias. Both omentum and intes-
tine were fixed to the sac at different points by very strong adhesions.
The former, being tied off above and divided, was easily disposed of.
The appearance of the intestine being normal, an effort was made to
free it in order to return it to the abdominal cavity. In places, however,
the loops of intestine had become so fused with the sac and with each
other that any method of separation, save by cutting, was impossible.
Although the greatest care was exercised in this separation, the lumen
of the bowel was accidentally opened at one point. When the coils
had been entirely freed and straightened out, it was found that the one
rent in the bowel, due to separating adherent coils, had opened its
lumen at three different points and some inches apart. The openings
were so large and irregular that closure by sutures was inexpedient. It
became necessary, therefore, to resect six or eight inches of intestine,
including all of the damaged portion, much as it was desired to ter-
minate speedily an operation already greatly prolonged by the diffi-
culties encountered. An end-to-end anastomosis was made, using the
Connell suture. The intestine was cleansed and returned to the abdo-
men, after which the wound was closed by through and through su-

The patient showed no unfavorable symptoms after the operation. The stitches were removed on the ninth day, when the wound was found healed, save for a very small point at the upper angle, which had fully closed two days later. The kidney lesion did not appear to be aggravated by the ether.

Six weeks after the operation a note says: The patient's "general condition is excellent."

VOLVULUS OF THE CECUM AND ASCENDING COLON.

By Alfred C. Wood, M. D.

Mrs. O'B., 34 years old, widow (Philadelphia, General Hospital, No. 1756), was admitted from the outwards on account of severe abdominal pain and vomiting, September 14, 1903.

Her statement was as follows: On the evening of September 13, 1903, she lifted a heavy woman into bed, and afterward "felt badly," although she did not report the matter, and did not do anything to get relief. About 11 o'clock on the following morning she felt a sudden, very sharp, lancinating pain in the abdomen. The pain continued, was paroxysmal in character and was so severe as to cause her to cry out; it seemed distributed equally over the abdomen. Vomiting began soon after the pain, and has since been almost continuous. The bowels acted regularly and normally until the beginning of the present trouble two days ago, since which time there has been no movement. The menstrual function is normal, the last period having been two weeks prior to this attack. The patient has one child living and in good health. There have been no miscarriages. There is no venereal history.

PHYSICAL EXAMINATION.—The patient looks older than the age she gives. She is well developed and fairly well nourished, the face is pale and the expression denotes acute suffering. The tongue is moist and clean. The pupils are small, equal and contract normally. The lungs are normal. The heart sounds are regular, but weak; pulse 86, and compressible. The abdomen is much distended, apparently more on the left side than the right. The surface above the umbilicus is red from the effects of a mustard plaster; striae gravidarum are prominent. The abdomen is everywhere board-like to the touch; no definite mass can be felt, and palpation gives the patient severe pain. The abdonimal pain is reflected up to the region of the right shoulder. Flexing the thighs upon the abdomen gives marked relief. During the severe pains the patient groans and tosses about the bed.

The vomitus is black, watery and has a sour odor, but is not bilious or fecal. There is a great deal of retching. The skin is bathed in a cold perspiration. The leucocyte count is 26,400. The urine contains albumin and hyaline and granular casts.

Operation, September 15: The writer did not have an opportunity to examine the patient until she had been placed under the influence of ether on the operating table. It was then possible to palpate a large, rounded, uniform mass, occupying chiefly the right lower quadrant of the abdomen. The abdomen was opened through an incision along the outer border of the right rectus muscle. A quantity of dark-colored, offensive fluid escaped from the abdominal cavity when the peritoneum was opened. Peritonitis had evidently already begun. The tumor was found to be a distended loop of intestine, which, on inspection, proved to be a volvulus. The bowel forming the volvulus was lustre-less and of a deep purple color, looking almost gangrenous. There did not seem to be anything but gas in the distended loop. The bowel was delivered from the abdomen and untwisted without incising; the dis- · tension disappearing as reduction took place. The volvulus was com-posed of the cecum and part of the ascending colon. Every portion of both of these structures was so devitalized that resection was impera-tive. The ileum adjacent to the cecum appeared to be but little affect-ed; there were no gross changes that would lead one to question its vitality. The latter was therefore divided near the ileocecal valve, and the colon at the hepatic flexure, the two ends being united without diffi-culty by means of Murphy's large-sized button. The gauze pads which had surrounded the field of operation were removed, the abdominal cavity was thoroughly flushed with sterile water and the wound closed by interrupted sutures.

The operation was concluded about 5 P. M. At 7 o'clock the pulse was recorded as 84, temperature, 99 2-5 degrees, respiration 28. There was but little change until 9 o'clock, when the pulse and respirations rose rather rapidly, and the temperature gradually. From this time on the patient failed steadily, and died at 4 o'clock the following after-noon, twenty-four hours after operation, the pulse having reached 180, the respiration 56 and the temperature 103 3-5 degrees.

The autopsy showed that several inches of the ileum adjacent to the point where it had been divided had become gangrenous, and there was a general peritonitis.

COMMENT.—A careful study of the relations of the parts affected was impossible on account of the necessity of concluding the operation

as speedily as possible. The conditions found, however, appeared to be as follows: The cecum was at the upper extremity of the tumor and internal to the colon. A single turn relieved the volvulus.

The mechanism of this case seems to have been as follows: The descent of a loop of ascending colon, made possible by an abnormally long mesocolon. The falling of the colon revolved the cecum on its antero-posterior axis, so that it first pointed toward the right and, as the process continued, upward. As distension in the loop took place, the cecum was forced upward along the parietal wall, carrying the ileum with it, until it finally crossed over the ascending colon anteriorly.

Treves divides volvulus of the ascending colon and cecum into three categories: (1) A twist of the ascending colon around its own axis.

(2) Twists brought about by an abnormal loop formed by the ascending colon and cecum with a long and distinct meso-colon.

(3) Twists of the cecum "upon itself" or about its own axis.

The case here reported belongs under the second division.

According to Treves, more than two-thirds of all cases of volvulus of the intestine occur as a result of rotation of the sigmoid flexure on its mesenteric axis, whereas twists of the cecum and ascending colon are among the least common varieties of intestinal obstruction.

As to the causes of volvulus of the cecum the same authority states that chronic constipation ranks first, while in the second and third of the varieties just mentioned some congenital abnormality has been present in all the reported cases without which the twist could not have occurred. This abnormality related either to defective development of the cecum; that is, to a faulty position, or to an unusually long mesentery.

Peritonitis is a very constant and early complication in these cases. When the loop of intestine is greatly distended the overlying peritoneum may be torn in one or more places. Such a rent is to be observed in the accompanying cut.

Volvulus of the Cecum and Ascending Color

TUBO-OVARIAN ABSCESS ON LEFT SIDE, TUBAL GESTATION ON RIGHT; OPERATION; ACUTE ENDOCARDITIS DURING CONVALESCENCE.

By Elizabeth L. Peck, M. D.

J. F., 22 years old, Italian, giving a history of having been married ten months, was admitted to the venereal wards of the Philadelphia Hospital in the latter part of April, 1903, suffering from a profuse vaginal discharge, which proved to be gonorrheal in character. She was treated for this condition for about two weeks, her inability to speak English probably preventing the recognition of her acute suffering due to the pelvic condition. Her temperature was moderately elevated and her pulse rapid during this time. No menstrual history could be obtained. On May 11 I saw her first. Bimanual examination showed the uterus to be rather large. There was a pus tube with a large ovary and some apparent exudate on the left side; a larger and much harder mass occupied the right side, and here no softening or fluctuation could be made out.

The patient was transferred to the gynecological ward and prepared for operation on Wednesday, May 13.

On Tuesday evening, May 12, she suddenly went into a state of collapse. The temperature dropped from 101 degrees F. to 90 degrees F., the pulse became very weak and rapid and the skin was cold and clammy. This occurred at 6.30 P. M. At 8 P. M. she had rallied somewhat under free stimulation, and operation was begun.

On opening the abdomen some clear fluid was found in the peritoneal cavity. The intestines were well protected with gauze, and the left tube and ovary, which were adherent deep in the pelvis, were peeled out. A little pus escaped as the tubo-ovarian abscess was removed.

On the right side the tube was very large and firm and contained no pus, but on section showed a gestation sac surrounded by laminæ of hard and partially inspissated clot. There was no sign of recent bleeding, and there was no free blood or pus found in the abdomen, as I have said. This is an important point in consideration of the later history.

There was only moderate oozing following the dissection, so the abdomen was closed with tier sutures, and the patient was returned to bed in better condition than before operation. During the night she was extremely restless, and at 2 A. M. the temperature fell to 94 degrees F., and the pulse was imperceptible. She rallied, however, under free stimulation and by afternoon the

temperature was normal and the pulse, though 140, was stronger. Not under-
standing English, her mental condition was depressed by the suffering, which
could not be explained to her. Forty-eight hours after operation there was
some abdominal rigidity and the wound did not look well. The lower angle was
very vascular at the time of operation, and some oozing from this area had
dissected up the layers of the abdominal wound. Some dark blood was re-
moved and the cavity packed after flushing. The peritoneum was reopened
for a short distance, but nothing found except a small quantity of dark blood.
The abdominal wound healed without further trouble, and the abdominal con-
dition at no time indicated the presence of a peritonitis.

Before operation the heart, though rapid in action, the pulse running above
100, had been normal in area and the sounds clear. But a severe endo- and
myocarditis now appeared, the pulse was very rapid and feeble, the rate
about 140 and the widespread wavy impulse of the right ventricle was distinctly
visible through the chest wall. The cardiac dilatation was extreme. For days
she was in a most alarming condition. But in three and a half weeks after op-
eration she was fairly convalescent, and made a good recovery.

The cause of collapse before operation in this case is a very interest-
ing question. Given the pelvic findings at the first examination with no
other evident disease, and I think no one would hesitate to consider it
due to sudden peritoneal irritation. But there was no sudden abdom-
inal hemorrhage either free or around the gestation sac. There was
no purulent peritonitis following the operation as might have been ex-
pected had there been leakage of pus from the left tubo-ovarian abscess.
On the other hand, if we explain the absence of peritonitis as due to the
prompt removal of the pus focus by operation, we have still the grave
cardiac conditions to account for, and the conditions during and after
operation do not seem to explain this. It seems most probable, since,
fortunately, there was no opportunity to verify the condition that the
collapse was due to an acute endocarditis, dependent on the gono-
rrheal inflammation and seriously complicating both operation and
operative recovery. The patient was extremely ill for three weeks,
typhoid fever was rigorously excluded and it was her cardiac and
not her pelvic condition which gave most anxiety. It is a matter of
some interest that her height was four feet seven inches and her pelvic
measurements: Between the iliac spines, 24 cm.; between the iliac
crests, 25½ cm.; the external conjugate, 16¾ cm.

REMARKS UPON THE SURGICAL ASPECTS OF TUMORS OF THE CEREBELLUM.

By CHARLES H. FRAZIER, M. D.

ANATOMICAL CONSIDERATIONS.

The difficulties that attend an attempt on the part of the surgeon to expose, much less remove, tumors from the cerebellum, differ very materially from those encountered in tumors of the cerebrum. Speaking upon this subject on another occasion I said that it seemed as though, in encompassing the cerebellum with such large cranial sinuses, nature had intimated that this organ was never to be subjected to exposure at the hands of the surgeon. When one takes into consideration the position of the lateral and the occipital sinuses with relation to the only means of access to the cerebellum, and the plane of the tentorium cerebelli, one realizes at once that there are especial technical difficulties in surgical attacks upon the cerebellum. Furthermore it must be remembered that there are very distinct dangers attending manipulations upon the cerebellum and, more particularly, if, in an attempt to get sufficient exposure to excise a tumor, one should make too much traction upon the medulla oblongata. Even when one has removed a considerable portion of the skull below the superior curved line, there will be exposed to view but a small portion of the gross surface area of the cerebellum. Neither the upper surface, that is in relation with the tentorium cerebelli, nor the anterior surface, which is in relation with the petrous surface of the temporal bone, nor the mesial surface will be exposed to view by this procedure, whereas in the cerebrum the entire cortex and a considerable portion of the base can be laid bare by a very simple osteoplastic operation. Furthermore, the cavity of the cerebellum is very much smaller than that of the cerebrum so that there is very much less space in which to conduct the manipulations necessary either for exposure or removal of the tumor. In the adult skull one hemisphere of the cerebellum is contained in a cavity whose greatest diameter is only (10.5) cm. In addition to the difficulties that are associated with operations in a space so small and difficult of approach, one is hampered

further by the fact that even under normal conditions the cerebellar hemispheres are compressed into a relatively smaller space than the hemispheres of the cerebrum, and are under such tension that when tension is relieved by the reflection of a dural flap the cerebellar tissue almost invariably protrudes through the opening. The tissues cannot be displaced or retracted either to the same degree or with as much ease as can the cerebral lobes. Thus the operator will be embarrassed in attempting to expose a lesion deeply situated, as for example at the cerebello-pontile angle, a favorite seat for tumors.

In addition to the larger sinuses—the lateral and occipital—certain tributaries of sufficient size to cause, when injured, profuse and sometimes alarming hemorrhage, penetrate that portion of the occipital bone which must be removed. The most constant of these is a branch of the lateral sinus which passes obliquely through the skull and appears in the surface between one and two centimetres to the inner side of the mastoid process; occasionally one or more will be found just below the superior curved line in the neighborhood of the occipital protuberance.

The occipital bone overlying the cerebellum is very variable in thickness. In the region of the mastoid process and of the occipital protuberance the bone is exceedingly thick, but from these two processes the thickness of the bone gradually decreases until at a point about midway between the two it will be found comparatively thin.

INDICATIONS FOR OPERATION.—In general terms it may be said that the indications for operation in cases of suspected tumors of the cerebellum do not differ materially from those which have been endorsed in the treatment of tumors of the cerebrum. In both classes of cases once the diagnosis has been made, operation if it is to be performed at all, should not be postponed for any length of time. Physicians are too prone to put off the time indefinitely almost, and to spend months in the often fruitless administration of antisyphilitics, or to spend an unwarrantable amount of time in efforts to establish a diagnosis beyond a peradventure of doubt, or to localize the tumor with mathematical accuracy. Kocher says there should be less delay in bringing to the surgeon a lesion of the encephalon, whether it be a neoplasm, tubercle, gumma or abscess. "There is no more excuse to-day for delaying operation in cases of tumors because the tumor could not be exactly localized, than there would be for declining to operate upon a case of intercranial hemorrhage because one was unable to determine positively of the clot. Failing in one place to find the tumor, other tre-

phine openings may be made or a very extensive area may be exposed by an osteoplastic resection." "How often," Kocher says, "has one trephined over the anterior branch of the middle meningeal artery when the autopsy revealed the clot in the region of the posterior branch." The surgeon might come in for his share of criticism because of his lack of precise knowledge concerning the neurological aspects of the disease. In order that the very best results be obtained the internist and the surgeon must work hand in hand in this as well as other fields.   In cases of suspected tumors of the viscera an exploratory operation is now regarded as perfectly justifiable, and why? Because physicians have come to realize that if operation is postponed until the presence of the tumor can be demonstrated by palpation or other means, the lesion is by this time so extensive that the time for a radical operation has passed.   As the exploratory operation is recognized as the surest, safest and most reliable diagnostic measure in tumors of the stomach, it should be considered of equal value and importance in tumors of the brain.   Postponement of operation should be discountenanced if for no other reason than because in cases of long duration patients with tumors of the brain make very poor subjects for operative intervention; the operation is of itself one of considerable gravity and the condition of the patient should be so good as to enable him to withstand its depressing effect.   Unfortunately tumors of the cerebellum are in the majority of instances more difficult of localization than tumors of the cerebrum, and in many cases localization is well-nigh impossible.   Instead of regarding this, as has been the case so often, as a reason for delay, the difficulty of localization should be considered rather as an indication for an early exploratory operation.   Just so soon as the diagnosis is with a resonable degree of certainty assured, just so soon should the operation be performed, providing other measures have failed and the operation per se is not contra-indicated.

UPERATION AS A PALLIATIVE MEASURE.—Under certain circumstances we despair of being able to perform a radical operation; either the tumor cannot be found or cannot be localized; it may be inaccessible, or it may have attained such proportions as to make its removal impracticable. In any of these contingencies a palliative operation is justifiable and in some cases should be regarded as imperative.   The headache, vertigo and vomiting, so constant in cerebellar tumors, make the life of the patient pitiable; and yet he may be relieved of all of these symptoms for a considerable time by adopting such measures as will relieve pressure.   But the strongest argument against delay of opera-

tion in the treatment of cerebellar tumors is the possibility of being able to save the patient's vision. Choked disc is one of the most constant symptoms and if permitted to continue unrelieved too long, an optic neuritis will develop and the time for complete or even partial restoration of vision will have passed. Nothing could be more striking than the results of palliative operation in one of our patients. The patient before the operation suffered from intense headache, was almost entirely blind, and vertigo was so pronounced that he could not stand without support. The tumor could not be found, but a large portion, perhaps one-third to one-half of one cerebellar hemisphere was removed. His headache was relieved at once, within a week he was able to see as he lay in bed small specks on the ceiling, and on getting up was able to go about with but very little instability. Nothing could be more gratifying to the physicians in attendance than the relief which was afforded the patient by this comparatively simple procedure. In one of Krause's cases, after a palliative operation, the patient was relieved of many of the subjective disturbances and lived for a period of three years in comparative comfort.

OPERATIVE TECHNIQUE.—Position of patient.—It is advisable to operate with the head and shoulders of the patient considerably elevated. This will reduce to a certain extent the hemorrhage. The effect of the elevated position on the blood pressure may be counteracted by applying a firm bandage to the lower extremities. In order to afford greater freedom for the necessary steps of the operation, I use an extension— a very simple appliance—which is easily attached to the operating table and upon which the head rests (see figure 2). While using it in all operations upon the brain I find it most serviceable in operations upon the cerebellum where the quarters are especially cramped. In two operations upon the cerebellum Schede placed his patients in the sitting posture, leaning far forward. This posture, according to Schede, diminishes to a considerable degree the hemorrhage, but the position is a very awkward one and a difficult one in which to retain the fully anesthetized and relaxed patient. The patient may be placed upon his side, but it is difficult to retain the patient in this position, and there is always the tendency of the patient to roll over on his side, in which position the respiratory act will be embarrassed; and inasmuch as many of the sudden deaths are due to respiratory failure, it is advisable to take such precautionary measures as will avoid any disturb- of the respiration.

INCISION.—The incision should begin at the tip of the mastoid process on the affected side, and follow a line parallel with, but one centimetre above, the superior curved line to the median line. From this junction a vertical incision may be made downwards, to enable one to reflect the flap sufficiently to expose the field of operation. Hemorrhage from the scalp in this region is so profuse that some precaution should be taken to reduce to a minumum the amount of blood lost. A very excellent plan is to incise but an inch or an inch and a half at a time, proceeding at once to arrest the hemorrhage in one section before incising the next. Considerable bleeding may be prevented if one reflects the pericranium simultaneously with the overlying muscles and their attachments. If this precaution is taken the muscles will not be mutilated to the same extent as would be necessary if an attempt was made to reflect them independently of the overlying periosteum. What may be not only a troublesome but an alarming feature is the hemorrhage from the various sinuses that traverse the occipital bone. These have already been referred to in the section on the anatomy. Suffice it to say, that one should always be prepared with suitable means for controlling the bleeding from this source, since if uncontrolled the patient may lose in a very short time a pint or more of blood. In one of our cases two anomalous sinuses, almost as large in diameter as a quill, were found near the occipital protuberance. Before the hemorrhage could be checked the patient lost so large a quantity of blood that it was deemed advisable to suspend further interference until the patient had recovered fully from the effects of this complication. Following the administration of appropriate remedies the patient reacted within a reasonable time, but, about twelve hours after the operation, suddenly and without any warning, the cardiac and respiratory functions failed and within ten minutes the patient was dead. Whether the loss of so much blood had anything to do with the termination of the case is a matter purely of speculation. This instance is cited solely as an illustration of what may be a very serious complication, namely, hemorrhages from the venous channels traversing the occipital bone. One should try to control the bleeding first with Horseley's wax, and if, as in the case above referred to, this fails, the outlet of the sinuses should be closed with plugs of wood, which can be whittled to the proper thickness and length from ordinary swab sticks.

There need be no anxiety about the cranial sinuses as a possible source of hemorrhage. The lateral sinus is fully exposed to view when the bone has been removed, and injury to this structure could result

from carelessness only. The occipital sinus does not come within the field of operation unless one intends to remove the intervening bone, in which case the sinus will be exposed to view and if necessary may be ligated (see figure 5).

REMOVAL OF BONE.—With Krause, Schede and others, I believe that it is unnecessary to preserve the overlying bone—therefore the osteoplastic flap, which has done so much to revolutionize the surgery of tumors of the cerebrum, is not to be employed in the exploration of the cerebellum. As both Von Bermann and Kocher have said the muscles and aponeurosis are thick enough at this point to offer adequate protection to the underlying structures, and to make bony closure of the opening unnecessary.

An opening in the skull is made preferably with a chisel at a point about midway between the occipital protuberance and mastoid process. Here the bone is comparatively thin, and, as Poirier says, this is the point of greatest safety. The opening so made is enlarged with rongeur forceps in all directions; outwards as far as one can go without opening the mastoid cells, upward until the lateral sinus is entirely exposed to view, inward to within a centimetre of the median line, and downward to a point at least one centimetre distant from the foramen magnum. The removal of bone will be facilitated by using a pair of rongeur forceps the blades of which are at an angle of about 05 degrees with the handles. As one approaches the region of the lateral and occipital sinus the forceps should be laid aside for a moment and a dural separator introduced to separate the dura and the sinuses from the skull.

I prefer the chisel to the trephine for making the initial opening for two reasons: First, because the opening can be made more rapidly with chisel, and, secondly, because the operation of a trephine in this region is a somewhat awkward procedure.

EXPLORATION.—After a dural flap, with its base downward, has been reflected one proceeds to search for the tumor—unless it has been decided to resort to the two-stage operation. The principles which we have applied in determining the question are precisely those which have been adopted in our operations for tumors of the cerebrum (See American Journal of Medical Sciences, 1904). If when the preliminary stages of the operation have been completed the condition of the patient, as revealed by the blood pressure and pulse record, is one of depression or shock, the final stage of the operation should be postponed until the patient has reacted. Having decided to continue the operation

the surgeon proceeds to inspect and palpate the surface exposed to view. If the cerebellar tissues protrude considerably through the opening once the dura is incised, the presence of a tumor or an internal hydrocephalus should be suspected. It should be borne in mind, however, that under normal conditions the cerebellum is under greater tension than the cerebrum, and when the dura is incised the normal cerebellum will in many cases protrude to a slight degree through the opening.

If the clinical symptoms, to which are added the presence of an anomalous condition revealed by the sense of sight or touch, lead one to believe the tumor is situated in the lateral hemisphere, the subsequent steps of the operation should consist in an exploratory incision into the cerebellar tissue, and, if the tumor is found, in its complete extirpation. The impunity with which we can freely incise the cerebellar hemisphere without the risk of such disturbance of function as would follow a similar procedure in the motor area of the cerebral cortex should be borne in mind. A failure to find or expose a tumor of the cerebellar hemisphere because of an insufficient exploratory incision should be regarded as inexcusable, unless the tumor was of very small dimensions.

If, on the other hand, there is reason to believe the growth is situated at the cerebello-pontile angle—a favorite site for cerebellar tumors—the subsequent steps of the operation will be attended with some difficulty. It may be possible, in exceptional cases with the aid of a retractor to displace the cerebellar tissue sufficiently to expose the tumor, but in the great majority of cases one must resort to one of two methods to bring the tumor into view; either a portion of the cerebellar hemisphere must be removed or the ventricles must be punctured.

PUNCTURE OF THE VENTRICLES.—This procedure has been resorted to for two purposes, first as a purely palliative measure to relieve tension, and again to relieve tension in order to render it possible to make a more thorough exploration of the cerebellar surfaces. Puncture of the ventricles is, unfortunately, an operation of unusual gravity and the danger attending it is so great in comparison with the possible benefit as to make it a procedure of questionable propriety. Many cases have been reported in which the results were disastrous. In one reported by Krause a scalpel was introduced into the lateral ventricle, a drain introduced, and about 200 c.c. of cerebro-spinal fluid were withdrawn. The intercranial tension was relieved to such a degree that the operator was able to see the superior vermiform process, but the patient collapsed immediately after the fluid was withdrawn. Heidenhain's expe-

rience was equally disastrous. Thinking he was dealing with an idio-
pathic hydrocephalus and that the relief of pressure would have a
beneficial effect, he tapped one lateral ventrical and the patient died
suddenly on the night of the operation. Heidenhain attributed his
death to the sudden disturbance of pressure. The operation has been
practiced by a number of surgeons, and in one instance with favorable
results, but in the majority of cases the patient died immediately or
soon afterward.

LUMBAR PUNCTURE.—Von Bermann attributes the relief which fol-
lows palliative operations for tumors of the brain more to the escape
of cerebro-spinal fluid than to the removal of a large section of the
skull. Therefore in those cases in which the pressure symptoms are
very marked, but the tumor cannot be localized, he recommends the
removal of the cerebro-spinal fluid by Quincke's lumbar puncture. This
procedure he says, is much to be preferred to any others, but failing in
this recourse should be had to direct puncture of the lateral ventricles.
According to Oppenheim this operation is indicated in a very limited
number of cases, chief among which are those in which the tumor is
associated with an internal hydrocephalus, and especially when the tu-
mor encroaches upon the posterior fossa and threatens the life of the
patient. In a series of 50 cases collected by Piollet (Archives Provin-
ciales de Chirurgie, Vol X, p. 728) lumbar puncture was employed in
eight cases; in four there was transitory amelioration and four died
within a few days. The sudden disturbance of pressure is no doubt re-
sponsible for a large majority of the fatalities. In a few cases the
fatal issue has been attributed to the pressure of the structure of the
posterior fossa against the foramen magnum—an accident which could
easily happen when the communication between the cerebral and spinal
cavities was partly or altogether shut off, and when the vacuum created
by aspiration drew the pons and medulla forcibly into the foramen
magnum. If lumbar puncture is resorted to such an apparatus should
be used as Koenig suggested, in which the pressure is recorded while
the fluid is being withdrawn. With this precautionary measure the
danger of lumbar puncture would be reduced to a minimum. Furbing-
er, who is very much opposed to this practice, attributes the deaths to
pressure exerted upon the bulb by the arrest of cerebro-spinal fluid
from the ventricles at the foramen Magendie.

CONTINUOUS OR INTERMITTENT DISCHARGE OF CEREBRO-SPINAL
UID.—The advisability of affording means for the escape of cerebro-
fluid as a palliative measure might well be considered in connec-

tion with puncture of the lateral ventricle or lumbar puncture. There are cases on record in which subsequently to operation the flap has been punctured repeatedly for the purpose of relieving tension. After an exploratory operation, in which the tumor was not found, Terrier punctured the flap repeatedly and withdrew a considerable quantity of fluid, but the patient died in the third week after this form of treatment was adopted.

Jaboulay noticed the beneficial effect attending the escape of cerebro-spinal fluid through a fistula in the cicatrix, and recommends the establishment of such a fistula in cases in which the improvement after operation was only transitory, or in which there was no improvement. Theoretically at least such a treatment should afford some relief from the effects of intracranial pressure and might be justifiable in inoperable cases, but one must bear in mind the constant danger of infection that must needs attend the presence of a communicative tract between the surface and the underlying structures.

EXPOSURE OF THE CEREBELLO-PONTILE ANGLE.—To return to the question of exploration from which we digressed to consider the propriety of puncture of the lateral ventricles, to enable one to expose a tumor situated in the cerebello-pontile angle two methods were proposed, tapping the lateral ventricles and removal of a large portion of the cerebellar hemisphere. The former method we disapprove of on the grounds that it is so fatal in its tendencies. The alternative, on the other hand is attended with very different results. The impunity with which large sections of cerebellar tissue may be cut away not only without endangering life but without disturbance of function is an observation which was made by physiologists long ago. That the deduction naturally to be drawn from this bit of laboratory information has not been made use of by surgeons more generally is a matter of some surprise. The danger of exerting undue pressure or traction upon the pons or medulla in attempting to expose or remove the tumor is more to be dreaded than any other stage of the operation. It was only recently that Woolsey (Annals of Surgery, September, 1904) reported a case of neuro-fibroma of the acoustic nerve; the tumor was removed but the patient died three hours after the operation and death was believed to be due to hemorrhage within the pons. Woolsey was convinced that this was due to the traumatism indispensable to the frequent introduction and withdrawal of the fingers engaged in the removal of the tumor. Here is a case in which had a considerable portion of the hemisphere been removed prior to the attempts to extract the

tumor it is more than likely that the unfortunate accident would not have occurred. My experience with this procedure has been limited to two cases which will be referred to again. In one of these a considerable portion, from one-third to one-half, of the hemisphere was removed deliberately in searching for the tumor, without any appreciable effect upon the patient's general condition. In another case the same practice was adopted with equally negative results in so far as the patient's respiratory or circulatory functions were concerned. In neither of these cases was the tumor found at the first operation, but the amelioration that followed was striking. At a second operation upon one of these the tumor presented itself upon the surface of the remainder of the cerebellar tissue and was removed without any difficulty. This experience at once suggested to my mind what would seem to be an additional argument in favor of the deliberate removal of a large portion of the hemisphere; on the one hand serving as a means of affording adequate exposure with the minimum degree of traumatism to pons and medulla, on the other serving as a means of relieving intracranial tension temporarily and at the same time, by removing a certain amount of resistance, facilitating the growth of the tumor toward the surface to a point where it can be more easily seen and removed. Last year Hudson (American Journal of the Medical Sciences, September, 1903) reported two operations for cerebellar tumors, in one of which at least a large portion of the hemisphere was removed in searching for the tumor. The patient reacted promptly and, although the tumor was not found, began at once to improve. On a subsequent occasion the wound was reopened, a large cyst found and evacuated.

I feel convinced that this procedure, if more generally adopted, will do much toward increasing the percentage not only of tumors found, but of tumors removed, and will at the same time reduce the mortality.

SHORTEST ROUTE TO THE CEREBELLO-PONTILE ANGLE.—Before concluding our remarks upon the means of exposing tumors in the cerebello-pontile angle a word should be said concerning the best method of approach. One has but to turn to a cross section of the cerebellum to see that the shortest distance from the surface of the skull to this snug corner is along a line parallel with the petrous portion of the temporal bone (See figure 3). Krause in describing an tion for the division of the eighth nerve (Beiträge zur klinische rie, Bd. XXXVII, Heft 3) and others have made this anatomiation. The distance along this line being the shortest, it

goes without saying that the cerebello-pontile angle should be approached from lateral, rather than from the superior or inferior aspects of the cerebellum. The bony opening should extend just as near the mastoid process as possible. This is not only the shortest but the safest route in that the manipulations are carried on at a point farthest distant from such vital structures as the pons and medulla.

OPERATIONS UPON THE FIFTH AND EIGHTH NERVES OF THE CEREBELLAR FOSSA.—In an exploration of the anterior aspects of the cerebellum in the cerebello-pontile angle for tumors one exposes the posterior plane of the petrous portion of the temporal bone and with it the fifth, seventh and eighth nerves (See figure 4). The seventh and eighth nerves will be seen passing from the cerebellum to enter the internal auditory meatus. The eighth nerve is the larger of the two and overlies the seventh nerve in such a way that it almost entirely conceals it from view. Farther along at the apex of the petrous portion of the temporal bone will be seen the sensory root of trigeminus as it passes into the groove in which it traverses the petrous bone to enter the Gasserian ganglion on the opposite side. These three nerves,, together with the ninth, tenth and eleventh, may be said to be accessible, so that it is quite possible, did the indications arise, to divide any of them. It is not likely that in operations for the relief or trifacial neuralgia one would be called upon to divide the sensory root in the cerebellar fossa because the root and ganglion are more easily approached by the temporal route. In one of the cases of our series we seriously discussed the possibility of dividing the root in the cerebellar fossa and fully intended to do so under certain conditions. The case was one in which there were certain symptoms of cerebellar tumor and in addition intense tri-facial neuralgia. If the tumor could not be found it was thought best to afford the patient relief at least from the neuralgia by dividing the sensory root. However a cyst was found and evacuated and no further intervention seemed necessary. The patient was relieved entirely of her pain and has remained so now more than a year since operation. There is no conceivable indication for any operative attack upon the seventh nerve within the fossa, but in the case of the eighth nerve Krause has recommended and practiced its division for the relief of persistent tinnitus aurium. As recommended for tumors of the cerebello-pontile angle, so here, the nerve should be approached from the lateral rather than posterior aspect, as from this point is measured the shortest distance from the skull to the nerve. The only difficulty, if there is any in the operation, will be met with in separating

the eighth from the seventh nerve. The latter, as has been said, lies directly behind as one views the field from the side, and the precaution must be taken to separate one from other before attempting a nerve section. This is readily done with the aid of a small blunt hook. (See Fig. 4).

SIMULTANEOUS EXPOSURE OF BOTH HEMISPHERES—BILATERAL CRANIECTOMY.—The difficulty of localizing cerebellar tumors is known to all clinicians. In an analysis of the 116 cases which we have collected we find that in 55 per cent. of them operation was a failure because the tumor was not found. The diagnosis of cerebellar tumor is in many cases not so difficult, but in many of these it will be almost impossible to determine before hand whether the tumor is in the right or left lobe. Therefore in the course of an exploratory operation, when one has failed after a thorough search to find the tumor on the side which was opened first one must decide whether to proceed at once to explore the opposite side. In most instances further exploration should be postponed until the patient has reacted from the effects of the injury already inflicted. In one of our cases already referred to a section of the cerebellar hemisphere was removed to relieve tension temporarily and with most gratifying results. But whether this procedure is justifiable in the light of the probable existence of a tumor on the other side might with propriety be questioned. In order to enable one to examine both hemispheres at one sitting the authors discussed the feasibility of performing a craniectomy on both sides and removing the intervening bone. This operation was performed upon the cadaver from which the illustration in Figure 5 was drawn. The operation may be carried out as follows: An opening is made on either side in a manner similar to that when the operation is confined to one side. The dura and with it the superior longitudinal sinus are separated so that they may escape injury when the overlying bone is divided. A pair of forceps or, preferably, a Gigli saw, may be used to section the intervening bridge of bone. The Gigli saw is to be preferred because it is less likely to comminute the bone, which must be divided so near the foramen magnum. The falx cerebelli is punctured in either side of the occipital sinus and the sinus divided between two ligatures (see Figure 5). This will enable one to reflect a flap of the dura covering both hemispheres and afterwards to displace the cerebellum with great freedom than would be possible if an unyielding bridge of bone remained between the two openings. In the preparation of this paper we upon a perusal of the literature that this procedure has been

recommended by Kocher (Nothnagel, Path. und Ther., Vol. IX), and Krause (Beiträge zur klin. Chir.. Bd. XXXVII).   The latter performed this operation in a case in which there was much uncertainty as to the position of the tumor, and, in order to relieve tension still further, he punctured one lateral ventricle.   The results were reported to be satisfactory in so far as the freedom with which the various aspects of the cerebellum could be exposed.   The patient died one week later and the autopsy revealed an internal hydrocephalus, but no tumor.

We are not prepared to indorse this operation as a routine procedure, but believe it should be restricted to those cases in which the tumor is believed to occupy a position near the mesial surface.   Under any circumstances it should be practiced at two sittings; the additional trauma and hemorrhage which must accompany such an extensive incision and the removal of such an extensive section of bone would, we believe, add materially to the gravity of what under any circumstances is an extraordinarily serious operation.

LIGATURE OF THE LATERAL SINUS.—A discussion of the operative procedures in the region of the cerebellum would be incomplete did it not include some reference to ligation of the lateral sinus.   In an attempt to expose tumors particularly of the anterior surface of the cerebellum, the operator is hampered by the tentorium cerebelli, and the suggestion has been made by Kocher, Krause and others that the tentorium cerebelli be divided down to the petrous portion of the temporal bone after having ligated the lateral sinus.   It is claimed by Krause that one of the sinuses can be ligated without much risk and on at least one occasion the idea was put into effect.   The advantage to be gained by this modification of the technique I do not believe compensates for the additional risk that must be entailed.   If the mortality following operations upon the cerebellum is to be reduced the technique must be as simple as possible, the least degree of traumatism must be inflicted, the smallest possible insult offered to the tissues; therefore we should discard the more complicated procedures and those which interfere to a greater degree with the circulation and functional activity of the structures concerned.

SIMULTANEOUS EXPOSURE OF THE OCCIPITAL LOBE AND CEREBELLAR HEMISPHERE.—Included in the list of doubtful diagnoses are those in which there is a reasonable doubt as to whether the tumor is situated in the cerebellum or the occipital lobe.   In such cases one could at one sitting explore first the cerebellum by a craniectomy and the occipital lobe by a craniotomy (see Figure 4).

RESULTS: To speak first of the results of the cases which have come under the authors' observation. During the past twelve months six cases have been subjected to operation at the University Hospital, five of them were patients of Dr. Mills and one was a patient of Dr. McCarthy. The reports of these cases appear below, but the results may be expressed briefly in the following table:

TABLE I.

Cases under authors' observation during past 12 months.

Case 1. Unilateral craniectomy.	Tumor not found.	Recovery from operation, without improvement. Patient would not consent to further exploration.
Case 2. Craniectomy.	Tumor found and removed.	Recovery.
Case 3. Craniectomy.	Cyst found and evacuated.	Recovery.
Case 4. Craniectomy.	Tumor not found; one-third of hemisphere removed.	Striking improvement. Restoration of vision, relief of headache, vomiting and vertigo.
Case 5. Craniectomy,	Tumor found and removed.	Recovery.
Case 6. Craniectomy, 2 stage operation.	Dura not opened.	Death, sudden and unaccountable, 12 hours after first stage.

Still further condensed the results were as follows:

Of six cases: One died after first stage of operation; three recovered after removal of tumor; one considerably improved after palliative operation; one no improvement—tumor not found.

My personal experience with this series of cases leads me to believe that the dangers attending cerebellar operation have been exaggerated. The present generation of surgeons has inherited the traditional fear operations within the cranial cavity. It was not very long ago that n the gasserian ganglion were regarded as desperate un-
n it was a case of kill or cure; whereas at the present
n is undertaken with no especial concern except upon
, on account of their advanced years, may be unfavor-
r any major operation. And so it is with tumors of the

brain, and to a greater degree tumors of the cerebellum. Physicians put off the question of operation until the patient's condition becomes critical, and the surgeon undertakes the operation with fear and reluctance. It was not so long ago that Oppenheim classed all tumors of the cerebellum as inoperable, but in the last editions of his book (1902) he frankly confesses that his opinion on this point is in need of revision.

The dangers and risk peculiar to this operation lie in the proximity of the medulla and pons to the field of operation and the traumatism to which they may be subjected in the course of the operation. It is on this account that stress has been laid upon the advisability of approaching the cerebello-pontile angle from the lateral aspect in order not to injure these structures. In a case of Woolsey's previously referred to, the autopsy revealed a hemorrhage in the pons which the operator attributed to the traumatism to which it was subjected while he was removing piecemeal a tumor of the auditory nerve. If in the fatal cases a careful examination of pons and medulla had been made we believe that in a majority some evidence of traumatism would have been found. It is only in the avoidance of every possible source or degree of traumatism to these vital structures that surgeons can hope to obtain better results. In this connection we refer again to the impunity with which a considerable portion of one cerebellar hemisphere can be removed, since by so doing the operator not only can explore and expose the tumor, but also remove it without the necessity of exerting undue traction or pressure directly or indirectly upon the pons. This, of course, applies especially to tumors that were not within the hemisphere.

We have been struck especially with the comparatively slight depression attending operations upon the cerebellum and with the rapidity with which reaction ensues. In one of our cases the patient lost a large quantity of blood in a very short time, but recovered promptly from the effects after the administration of appropriate remedies. This patient died twelve hours after the operation, suddenly and unexpectedly, but ten minutes before he died his general condition was reported as excellent. Our experience, however, we believe to be exceptional, as there are recorded in literature many cases in which the patients died on the table or a few hours after the operation.

We have noted, however, that the gravity of the operation does not seem to have been affected by the act of removing the tumor—whether the operation was solely exploratory or palliative or whether a tumor was removed, the effect upon the patient was the same. In all these

(5)

operations careful records of the blood pressure were made with a view to ascertaining whether the action of removing the tumor was attended with or followed by lowering of the blood pressure. The results, however, were negative.

Statistical study of 116 cases of operation upon the cerebellum collected by Frazier.

Tumors found 45%
Tumors not found......................................55%
Removal with recovery...................................15%
Removal with improvement................................13.9%
Removal without improvement............................ 0.9%
Improvement without removal............................13.9%
No improvement without removal........................13.9%
Death when tumor was removed..........................12.9%
Death when tumor was not found and not removed............28.7%

	Frazier. 1904.	Duret. 1903.	Oppenheim. 1902.
Results.			
Recovery	15%	14%	7.5%
Improved	28	25	7.5
Unimproved	15	..	13
Mortality	42	60	71

A comparison of the statistics of successive dates, showing an increase in the percentage of recoveries and improvements, and a reduction in the mortality:

	Total number of cases.	Cases 1899-1904.
Results.		
Recovery	15%.	24%
Improved	28%	28.5%
Unimproved	15%	11%
Mortality	42%	35.8%

A comparison of the statistics of total number of cases in Frazier's collection with the statistics of the last five years, showing a manifest improvement in the results.

From a review of these tables one is struck at once with the progress that has been made in this field of surgery from every point of view. The percentage of tumors found is yearly growing larger, the percentage of partial or complete recoveries is larger and the mortality has fallen from 70 per cent. to 38 per cent. We believe that the results of surgical intervention upon the cerebellar hemisphere will continue to improve, if not generally, at least in the hands of those who are giving his subject especial thought and attention.

FIG. 1.
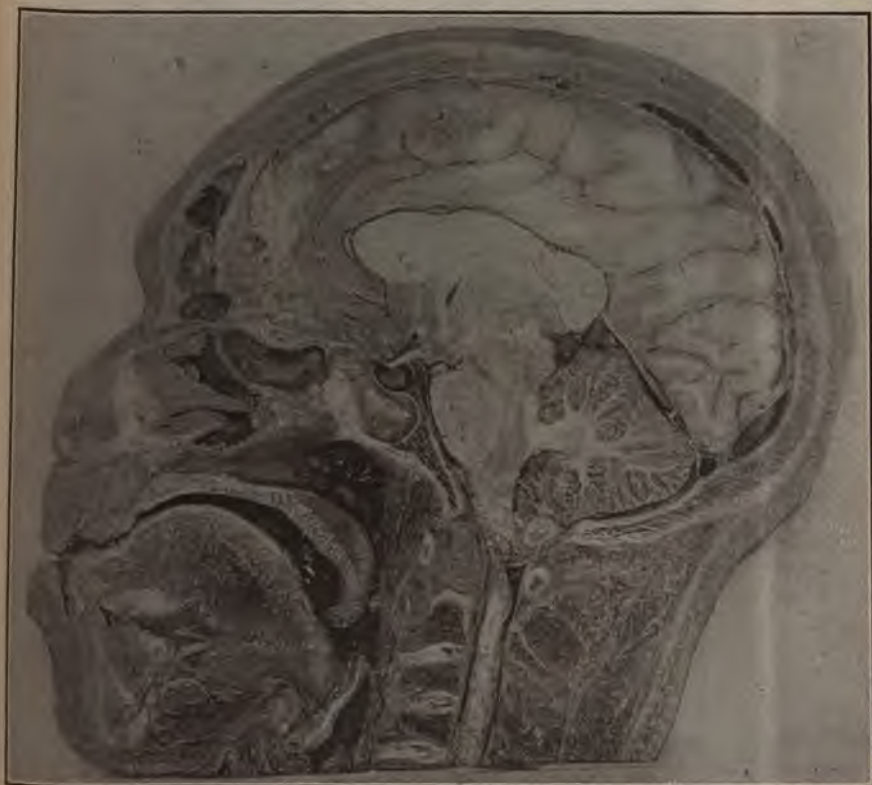
Vertical section of head, showing the comparatively small cavity in which the cerebellum is contained and its inaccessibility. Note the distance between the cerebellum and the cutaneous surface; note also the angle of the tentorium and the position of the lateral sinus.

FIG. 2.

"A head rest" that may be used to advantage in operations upon the head. The device is a very simple one and does not require a screw or bolt to secure it in place.

FIG. 6.
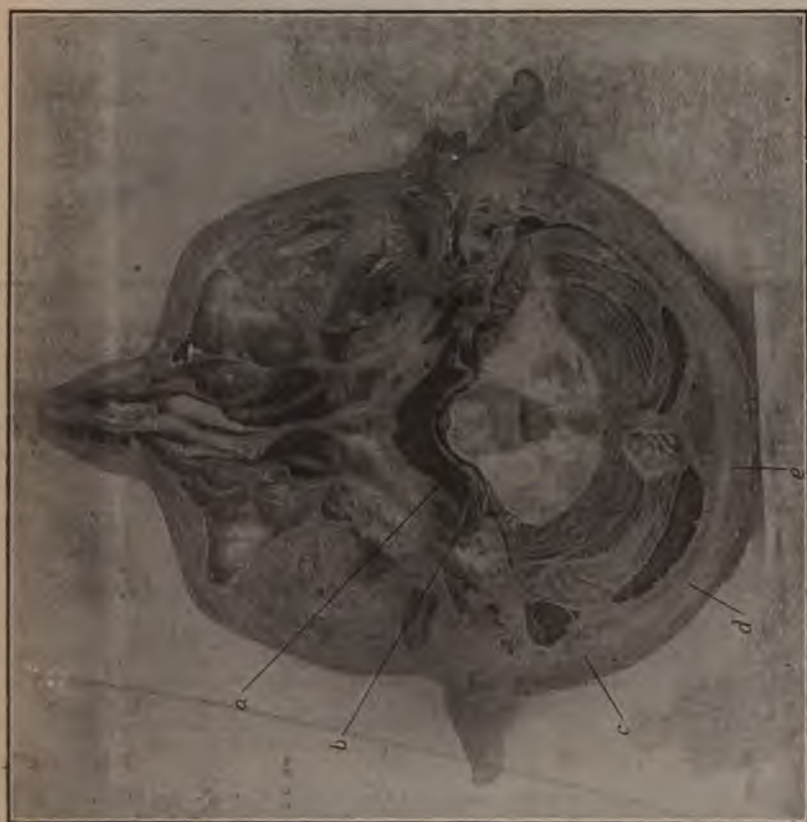
Photograph of a horizontal section of the head cut on a level with the external auditory meatus; *a*, representing a point at the cerebellopontile angle; *b*, the auditory nerve entering the internal auditory meatus; *c*, *d*, *e*, three points on the skull. Note the distance between point *a*, and the points *c*, *d*, and *e* as illustrating the shortest route to the cerebellopontile angle respectively. The shortest distance from the skull to the angle is measured along a line drawn between *a* and *c*. The farther away from *c* or the nearer to *e* the greater will be this distance.

FIG. 4.
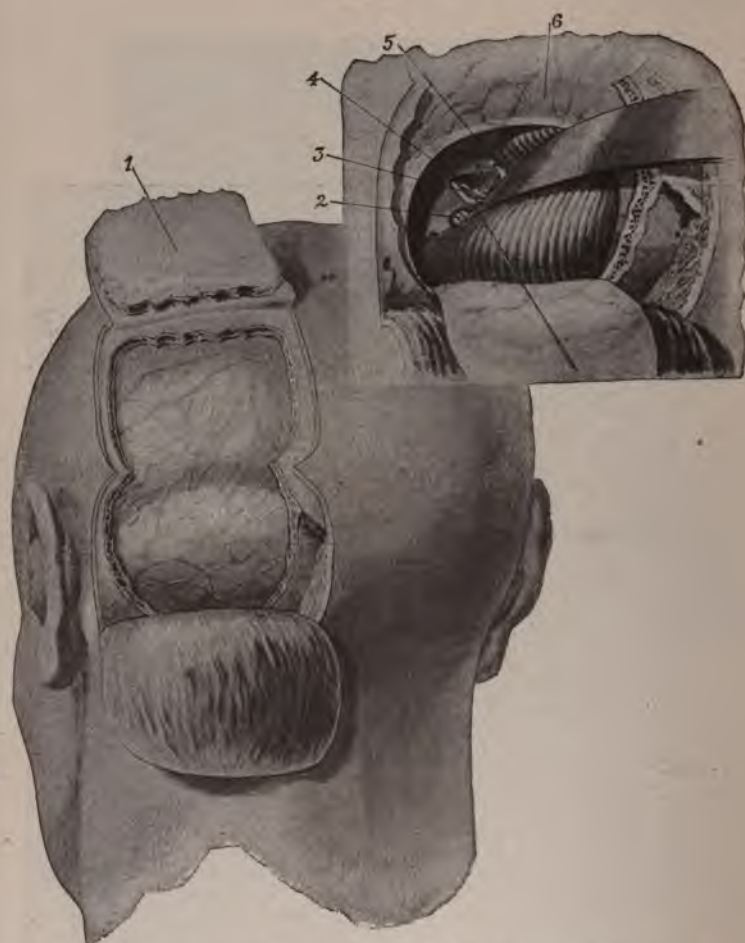
The larger figure to the left illustrates the operation for the combined exposure of one
cerebellar hemisphere and the occipital lobe of the cerebrum. The smaller figure,
above and to the right, illustrates the structures in relation to the anterior aspect of
the cerebellum and the petrous portion of the temporal bone. Attention is called
especially to the position of the 5th, 7th, and 8th cranial nerves. This drawing was
made by viewing the structures from the lateral aspect, such an exposure as would
be made in exploring for tumors of the cerebellopontile angle. 1. Osteoplastic flap
reflected in an operation for the combined exposure of occipital lobe and cerebellum.
2. Ninth, tenth, and eleventh cranial nerves. 3. Auditory nerve drawn to one side
by refractor in order to expose. 4. The facial nerve which lies directly beneath it.
5. The root of the trigeminus as it enters the groove at the apex of the petrous
portion of the temporal bone.

FIG. 5.
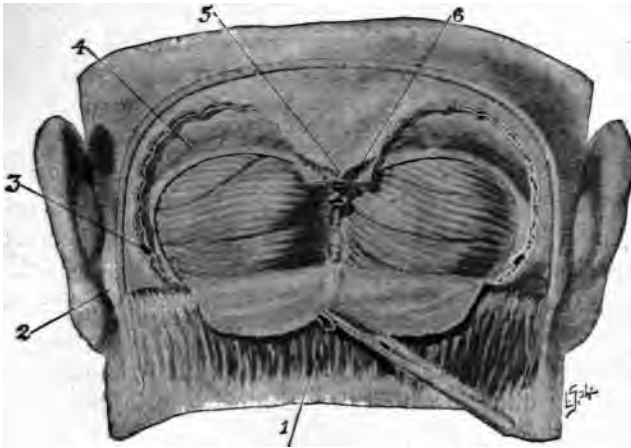
)peration for the simultaneous exposure of both cerebellar hemispheres, necessitating ligation of the occipital sinus. 1. The occipital sinus, which has been ligated previously and reflected with the dura. 2. Mastoid process. 3. A large tributary of the lateral sinus, invariably opened in cerebellar craniectomies and of varying dimensions; said to be sometimes as large as the lateral sinus. 4. Lateral sinus. 5. Occipital protuberance. 6. Occipital sinus.

was no albuminuria it did not appear after the first use of theocin, and if the urine was already albuminous it diminished in correspondence with the increase of the quantity of urine. There was some slowing of the pulse, but probably not more than could be accounted for by the diminution of the dropsy.

F. A. Suter,[1] from the surgical clinic of Prof. G. Julliard, reports three cases in which the action of theocin was favorable, and gives a review of the literature. In the first case a patient, 50 years old, had slight degeneration of the heart. After extirpation of the rectum, there was a daily urine excretion of 1000 to 1300 ccm., and once it fell below 1000 ccm. After the administration of three doses of 4½ grains of theocin, the urine which before had been 600 ccm., increased suddenly to 2000 ccm., and then gradually sank to 1800, 1600, 1500, and 1400 ccm., at which height it persisted for fourteen days, and did not again increase, although during four successive days theocin was given. About two weeks after stopping the theocin the volume of urine had fallen again to 800 ccm.

In the second case, a letter carrier, 50 years old, developed ascites, albuminuria, edema of the extremities, penis and scrotum, and dilatation of the heart. Various remedies were unsuccessfully tried to secure diuresis. From August 6th to September 2nd, the daily volume of urine passed varied from 600 to 800 ccm., on a single occasion it reached 950 ccm. On August 13, the abdomen was punctured and forty-two litres of fluid withdrawn; the puncture was repeated on August 24, and the same amount withdrawn; but the patient did not improve. On September 2, under theocin, the urine increased to 1900 ccm., the following day to 2150 ccm., and the day after to 1300. Theocin was then stopped and the urine gradually sank to 450 ccm. on September 18. Theocin was given on the 19th, the urine increased to 1200 ccm., on the 20th to 1200, 21st 1600, 22nd 1800, when the theocin was stopped; on the 23rd the excretion of urine was 1500 ccm., and then sank to 600 ccm., where it remained. The patient complained while taking theocin of increased palpitation and of headache.

In the third case, a woman 64 years old, had had dropsical enlargement of the belly, swelling of the feet, shortness of breath and palpitation for six years. For five months she had been obliged to stay in bed. The first abdominal puncture was done five years before the date of Suter's report. Up to January, 1903, four more abdominal punctures were carried out. On August 29th, the patient being much op-

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1. Correspondenz-Blatt fur Schweizer Aertze, 1904, No. 7.

pressed, another puncture was made, and twenty quarts of fluid were withdrawn. She was then sent to the hospital. She had general anasarca and a dilated heart, with bronchitis. Digitalis raised the volume of urine to 350 ccm. Theocin caused an increase to 2500 ccm. Then for a month various diuretics were tried without success. Theocin again brought it up to 2300 ccm., and after a further intermission to 3050 ccm. the patient became able to get up and be about the room.

One patient complained of slight nausea, but she bore every medication badly.

J. Meinertz [1] has employed it in twenty-three cases at the Berlin City Hospital. There were six cases grouped as cardiac diseases; four of pleuritis; seven of kidney diseases; one of cirrhosis of the liver; one of chlorosis, and four of various conditions not attended with dropsy.

Meinertz reports each case briefly, but only with reference to diuresis. In one of the cardiac cases in which there was no edema only slight diuresis was obtained. In one case of acute nephritis theocin had no influence on the secretion of urine. In one case of chronic nephritis. it had a slight effect and then failed. In a case of pyelonephritis it had no influence; and there was no effect in four cases in which it was administered for no special indication, but just for experiment. With these exceptions there was a marked effect upon the secretion of urine in all the cases. Diuresis sets in very promptly after the administration of theocin, the volume of urine often being doubled, and occasionally quadrupled and quintupled. The effect is never permanent, but disappears in a few days, or at the most at the end of a week. Nevertheless, the patient does not become habituated to it. In one of his cases, during ten weeks, the remedy was given seven times, after periods of intermission, and at the seventh trial the effect was just as great as during the first time.

Mises, [2] from Pisek's clinic, has obtained substantially the same results. He reports three cases, and says it has been employed in about twenty, and has rarely failed. He finds arteriosclerosis even if of high grade, no contraindication. It acts better in cardiac than in renal edemas.

Oskar Stross [3] has employed it in about fifty cases. Several of his cases are reported in detail. On the whole the results which he obtained are as good as those reported by others. But he remarks that in

1. Therapeutishe Monatshefte, February, 1903.
2. Die Heilkunde, VII. Jahr. 12 Heft. December, 1903.
3. Wiener klin. Rundschau, 1903, No. 20.

a series of cases there were disagreeable symptoms produced, namely, nausea, vomiting, excitement, headache and sleeplessness. In some cases they were so marked that in spite of striking improvement of the general condition the patients took the drug only against their will.

In most cases in which the remedy was not well borne its disagreeable effects were overcome by giving it in combination with hedonal, morphine, or opium and belladonna. He found it most satisfactory to give 7½ grs. hedonal with the last dose of theocin. He notes as others have done that small doses, 4½ to 5 grains, are sufficient, and that large doses do not succeed after small doses fail. But if the drug is stopped for a few days, it will again on its resumption produce diuresis. He notes also that its action is not persistent. Stross detected no effect upon the heart. The blood pressure was tested in some cases by Gaertner's tonometer. There was neither a constant increase nor decrease in blood pressure, perhaps rather the latter, but this could not be regarded as a regular symptom. The pulse frequently was not influenced.

The disagreeable effects noted were nausea and vomiting, which were never threatening, and which disappeared when the drug was stopped. Sometimes when it had to be stopped, on account of induced vomiting, it was well borne when again given after an interval of a few days; and, vice versa, it might be well borne at first and badly borne on a second trial.

He regards the indications for its use as the same as for theobromine. It acts best in conditions of edema from stasis. Patients who are much reduced in strength and who have severe disturbances of compensation seem to bear it least.

He adds in a note that he has found theocin given with Belladonna:

Theocin 0.25 bis 0.30.

Ext Bell. 0.005 bis 0.01

b. d. or t. d.

To overcome disagreeable effects without lessening diureses; this combination seems also to favor action on the bowels.

He refers also to two cases reported by Schlesinger, in which theocin induced epileptic attacks; and Stross has himself recently met with a case in which a patient with severe stenosis of the coronary artery and stenocardiac attacks had epileptiform seizures. In a second case, in which there was coronary stenosis with aortic insufficiency, the patient took 4½ grains of theocin with morphine, twice daily during four days, and then developed Cheyne-Stokes breathing with epileptiform

spasms. At autopsy there was found edema of the brain and atheroma of the cerebral vessels, in addition to the conditions already mentioned. As these symptoms may occur in coronary stenosis anyway (cf. Handbuch der pract. Med. Romberg, Herzrank.) Stoss doubts if there was a causal relation between the theocin and the convulsive attacks.

Hundt [1] noted a favorable action in cases of cardiac edema, and only one failure, which occurred in a case of rapidly fatal myocarditis. In one case in which under digitalis (3.0 in three days) there was no higher volume of urine than 800 ccm., after theocin (0.15—six times daily) there was an increase to 1900 ccm. on the first day, to 2700 ccm. on the second day, and then on following day a fall of 1400 or 1800 ccm. While in all cases there was a certain increase in the volume of urine, yet it rarely surpassed the normal and did not effect removal of the fluid or disappearance of the edema. In acute nephritis, on the other hand, the results were surprisingly good. He tested the remedy in seven cases and it failed in only two. In one of the failures the patient, a boy 12 years old, had acute hemorrhage nephritis. Theocin, in fact, other remedies, too, excited vomiting, so that its administration was difficult, and first became possible with the addition of small doses of opium. But it had no effect on diuresis and the edema seemed to increase. In the second case, a boy 11 years old, had scarlatinal nephritis. Yet, perhaps theocin should not be blamed with the failure, as the boy had at the same time a bilateral otitis media, and a large abscess at the angle of the jaw, which broke down the l oy, who was already very weak.

A brilliant result was achieved in a woman 31 years old, who was very anemic and had colossal edema and free ascites. During the first few days the patient had a temperature between 100 and 104 degrees. The pulse was good. The urine on the first day amounted to 400 ccm., specific gravity 1035; it contained 2½ per cent. of albumin, hyaline, epithelial and blood casts, and many free red and white blood cells. There was much vesical tenesmus. The diagnosis was cysto-pyelo-nephritis. Under diuretin the urine increased to something over 2000 ccm., which was maintained for four days. At the same time a hot full bath was given daily and the bladder washed out. On the fourth day 4½ grs. of theocin was given three times daily. The urine increased to about 6000 ccm.; on the following day the volume was 3000 to 4600 ccm.,

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1. Ein Beitrag sur diuretischen Wirkung des Theocins, speziele bei akuter Nephritis. Therapeut. Monatshefte, April, 1904.

and much was lost through a diarrhea. The temperature fell, and on the fifth day reached normal. Casts and cell elements were fewer. On the tenth day the albumin was still one-half of one per cent. Edema of the extremities had nearly subsided, and ascites was much diminished. From the tenth day of the disease the action of theocin began to fail. The urine fell to 1600 ccm., whereupon theocin was stopped and instead six grains of diuretin were given in forty-eight hours. The urine again rose to 3000 ccm. On the following days theocin was again given. The result was prompt, the urine increased to 4400 ccm. Thereafter the two drugs were alternated, and in this way the diuresis was kept at over 2000 ccm., and gradually in the course of four weeks the dropsy wholly disappeared. After six weeks there were still traces of albumin in the urine, but casts, blood cells and epithelium were in general no longer found. The woman was soon dismissed completely recovered.

The same happy result was obtained from alternate use of theocin and diuretin in the case of a girl 17 years old, who had edema from acute hemorrhagic nephritis in connection with scarlet fever. In three other cases of scarlatinal nephritis, in children from 5 to 11 years of age, there was a quick and strong action from the drug, although naturally it was given only in small doses. That caution in the dose is necessary is shown by the fact that in a girl, 11 years old, who received 1½ grains theocin three times daily, epileptiform convulsions with loss of consciousness and involuntary discharge of urine and feces occurred. After stopping the drug for several days it was again given in doses of 0.05 four times daily; on the evening of the same day a condition developed which could be described as weakness with mental confusion. The drug, therefore, had to be stopped, though it produced diuresis. Hundt favors a dose of ½ to 5-6 grain three times daily for children.

Drs. L. Aiken and J. Arnheim,[1] from the clinic of Lazarus at the Jewish Hospital, Berlin, report their experiences with theocin. In three cases (alcoholic cirrhosis of the liver, chronic parenchymatous nephritis, and stasis of the kidney in chronic myocarditis) every dose produced vomiting, which was not checked by copious quantities of warm fluid.

In one case, a man 72 years old, with general arteriosclerosis, and chronic interstitial myocarditis, interstitial nephritis and anasarca, the urine increased from 400 ccm. to 6500 ccm. after one day's use of theocin. But the next day it fell to 480 ccm., and no subsequent dose of

1. Therapeutische Monatshefte, January, 1904.

theocin had any effect on the volume of urine passed; subsequently digitalis produced a diuresis which was maintained for two weeks, and the edema disappeared.

In a case of alcoholic cirrhosis of the liver, with ascites of three years' duration, theocin at first provoked moderate diuresis, then failed, and subsequently calomel secured a continuous and more marked diuresis, with disappearance of the dropsy.

In a third case, a woman 50 years old, with severe myocarditis persisting nine years, accompanied with ascites and a pleural transudate. The patient received one dose of theocin then died of hemorrhagic infarct of lungs and intestines.

In another case, a woman 58 years old, with chronic interstitial myocarditis and arteriosclerosis, contracted kidneys and anasarca, received no benefit from any drugs until the fluid was drained away by scarifying the legs. Then both theocin and digitalis acted.

Two cases are reported in which digitalis aided the action of theocin.

The authors regard theocin as a surprisingly active remedy, which is purely renal in its action. This they think is shown by there being no effect on blood pressure until after diuresis occurs, and by the fact that in a case in which scarification was done to eliminate fluid, no increase in discharge was noted after theocin was given. Again, in a case examined post mortem, they discovered cloudy swelling and deficient coloration of the nuclei of all the parenchyma cells of the kidney. The woman had a cancer of the liver and oedema from pressure upon the vena cava, and interstitial nephritis. But they think the theocin may stand in causal relation to the kidney changes found.

In the following case, a woman 57 years old, with large white kidney, had been gradually strengthened for a year by dietetic and tonic measures. It was then thought that theocin could be used to get rid of the rest of the edema. Theophyllin sodium-salicylate (gr. 0.25) was given six times. It caused a large increase in the volume of urine excreted (from 1000 to 3100 ccm.), but a corresponding increase in the amount of albumin and of red cells present in the sediment. The authors think this shows an irritant action of the drug on the renal epithelium.

L. Loewenmayer[1] reports a case in which a child 9 years old had general dropsy from cardiac incompetency. There was mitral insufficiency with enlarged liver and spleen, scanty urine, and extreme dyspnea, as-

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1. Therapie der Gegenwart, April, 1904.

sociated with the general dropsy. The pulse was 150-160 per minute.
The volume of urine passed was about a pint daily. Digitalis, squill,
caffein, diuretin, had all failed, so also had calomel. Theocin was then
tried at a venture, as the only thing left short of mechanical evacuation
of the fluid. One and a half grains was given in tablet form three
times daily. Within the first twenty-four hours 3½ quarts of urine
were passed, and during the seven days of its use at least two quarts
were passed daily. At the end of the seven days the edema had dis-
appeared. The liver and spleen were diminished and the general con-
dition right good. But unfortunately the heart was not essentially in-
fluenced for the better. During eight months the child took 400 of the
tablets, because after they had got rid of the fluid it again accumulated,
and after a certain interval theocin had again to be given. The dose
had to be increased after a while, but the effect was not materially dif-
ferent in subsequent administrations of the drug.
Hackl reports four cases in which he failed to get any result from
   On the other hand in the same issue of Therapie der Gegenwart, Max
theocin because it was immediately vomited. It does not appear that
he used any combinations with opium or belladonna to lessen this action.
   The writer used theocin in several cases in his works at the Phila-
delphia General Hospital in 1903; but the results were inconclusive,
largely because the quantity of urine passed was not carefully watched
and measured. Last summer a private patient presented himself, who
exhibited the conditions in the overcoming of which theocin has shown
its most brilliant successes. The patient was a man, 62 years old, who
gave a history of two attacks of rheumatic fever, one in 1884 and
another in 1887. He began to have dyspnea about seven years ago,
but edema of the feet did not appear until three years later. About
January, 1904, he had general anasarca. He was seen first in June,
1904. There was a very large accumulation of fluid in the belly, which
was distended to its utmost capacity. The penis and scrotum were
also greatly swollen, the limbs were huge, and the left pleural sac was
two-thirds full of fluid. The urine was scanty, measuring about a pint
in twenty-four hours. It contained a large amount of albumin, and
was loaded with casts, principally pale granular, but with a few epithe-
lial casts. There were a moderate number of leukocytes, no red blood
cells, but an abundance of epithelium, transitional and renal. The
specific gravity was 1020. The heart was dilated and hypertrophied,
with displacement of apex heat beat to the anterior axillary line and
loud systolic mitral and tricuspid murmurs and venous pulse. Later a

diastolic murmur became audible along the left edge of the sternum. The patient suffered greatly from shortness of breath and insomnia, he was markedly cyanosed and was in a very anxious nervous state. He spent day and night in a rolling chair, being unable to lie down on account of dyspnoea. He was given some calomel, and a hypodermic injection of morphine, grain ⅛, at bedtime to secure sleep and quiet nervous restlessness. The action was very happy, the patient having a good sleep and feeling refreshed the following day. He was also igven digitalis and strophanthus, and later, at the suggestion of Dr. Musser, who saw the patient in consultation, Niemeyer's pill. These agents produced a decided improvement in the strength of the heart, lessened the dyspnea and greatly added to the comfort of the patient, but had no noticeable effect on the volume of urine, and comparatively little on the dropsy. I then ordered theocin in five grain doses three or four times daily. There was a very prompt and remarkable diuretic action. The patient passed a gallon of urine in twenty-four hours. So free was the urination that the patient complained that he had to pass urine all night long, and that his sleep was greatly disturbed. The patient continued to pass a gallon of urine daily for several days, after which the quantity gradually lessened. The cardiac tonics were kept up, and theocin again used after an interval. The dropsy steadily and rapidly lessened, first from the legs and scrotum, and later from the abdomen. An examination of the urine made twelve days after the patient was first seen showed a specific gravity of 1020, a small amount of albumin, no leukocytes, casts, red blood cells or cylindroids, and but a scanty amount of epithelium.

A note made a month later, when the patient was visiting the office, recorded entire absence of edema, except a little in the feet.

I have never before seen as prompt and large diuresis follow the administration of any drug.

In a patient with tuberculous peritonitis who always passed a very small amount of urine, averaging from eleven to fourteen ounces, five grains of theocin secured the passage of thirty-two ounces in twenty-four hours. But it caused vomiting and mucous diarrhoea and had, therefore, to be stopped. As I had tried all kinds of measures for some years before peritonitis developed to secure a free elimination of urine, and had never known the patient to pass more than a pint, I am confident that the theocin alone was in this case responsible for the diuresis.

In the following case, a man 68 years old, entered the Philadelphia Hospital suffering with general anasarca, dyspnea and diarrhea. He

had been complaining for ten weeks. The edema began first in the feet and legs and spread upward until general anasarca occurred. He had a moderate dilation of the heart, but no valve lesion. The urine was scanty. On the patient's admission the urine had a specific gravity of 1009, contained albumin and hyaline casts. Under theocin, five grains four times daily, the urine increased from thirty ounces in twenty-four hours to seventy-four ounces and for ten days varied from forty ounces to eighty ounces. Once it dropped to thirty ounces (or rather that is the amount recorded on the chart). I have no doubt that these amounts record what was passed independently of the stools. The man recovered. The last examination of the urine, made a month after admission, still showed the presence of albumin and casts. The specific gravity of the urine was 1015.

In another case, a colored woman, 40 years old, was admitted to the hospital complaining of dyspnoea, ascites and edema of the legs and thighs. She was accustomed to drink large quantities of gin as well as of beer almost every day. The heart was hypertrophied and dilated. The liver could not be outlined. The urine was decreased in amount varying from fourteen to thirty-two ounces daily. It had a specific gravity of 1022, contained albumin, hyaline casts, and some red and white blood cells. Under theocin sodium acetate, the urine increased almost without exception, running from forty to fifty ounces or more in twenty-four hours. The edema at first lessened, but subsequently increased, the patient became very dyspneic and died. At autopsy, the pathological diagnosis was hypertrophy and dilation of the heart, chronic carditis, adhesions and shortening of the aortic cusps, thickening of the mitral valve, chronic diffuse nephritis, cirrhosis of the liver with congestion.

In a fourth case, a negro 44 years old, entered the hospital complaining of cough, expectoration, pain in the abdomen, dyspnoea, and abdominal enlargement. The heart was dilated, the apex beat being in the seventh interspace in the anterior axillary line. Pulsation was visible all over the precordium. There was systolic retraction of the nipple region and of the eleventh and twelfth ribs posteriorly on the left side. The abdomen contained a large amount of fluid. The liver was enlarged and tender on pressure. The right pleura contained fluid, eighty ounces being later obtained by aspiration. The urine had a specific gravity of 1026, contained a trace of albumin, and numerous granular and hyaline casts. The patient was given infusion of digitalis and acetate of ammonium, the daily urine recorded was forty-one,

twenty-eight and fifty-seven ounces. Under theocin, given three times daily, it was fifty, eighty, thirty-four and twenty-one ounces. The following day, after theocin was stopped, it was fifty-one, fifty-two and fifty ounces in twenty-four hours. Theocin was again given in the same amount. The urine was fifty-four, fifty-five, seventy-one and fifty-nine ounces.

I suspect that some of the urine was passed with stools and not recorded. The heart diminished greatly in size, and the fluid in the abdomen had nearly disappeared at the last note I have of the patient.

In a case of pleurisy with effusion no effect in lessening the exudate was noticed from the use of theocin.

In a case of huge ascites occurring after septic infection or childbirth, theocin caused some diuresis, but it was not marked, and the drug provoked nausea and mucous diarrhoea. The patient had also an endocarditis and a pleurisy with effusion. The only organism found in the exudate was the pneumococcus.

In the case of a young woman who was admitted to the Hospital on May 8, 1905, with general anasarca from cardio-renal disease, no substantial improvement in her condition could be brought about by rest, tonics and diuretics. There was a history of rheumatic attacks, and she had a dilated heart, with loud mitral systolic murmur. The liver was greatly enlarged, the urine was scanty, ranging from 24 to 30 ounces in 24 hours, and containing albumin and casts. Diuretin failed to produce any diuresis. Theocin sodium acetate increased the volume of urine to 46, 44 and 42 ounces on three successive days, but without any benefit to the patient. She was just as dyspnec and dropsical as before its administration. Heroin increased the urine to 60 ounces in 24 hours, but the patient died with increasing signs of pulmonary congestion and infarction. At the autopsy there was found edema and infarction of both lungs, fatty and contracted kidneys, nutmeg liver, and an endocarditis with minute, beadlike vegetations on the leaflets of the valve. The failure of the theocin sodium acetate to provoke freer secretion from the kidneys was doubtless due to their extensive disease, as shown at autopsy.

In another case a man was admitted on May 5, 1905, with general dropsy, myocarditis, pleurisy and enlarged liver. The urine was scanty, averaging from 10 to 30 ounces in 24 hours, but was of good specific gravity, and showed neither albumin nor casts. After prolonged rest in bed and general and cardiac tonics had failed to effect much reduction in his dropsy, theocin sodium acetate was given in five-

grain doses three times daily.   The urine increased to 48-50 ounces in 24 hours, and though the drug was stopped in three days, diuresis was kept up by sparteine, caffeine and nitroglycerin, which previously had been ineffective.   Gradually the man's dropsy subsided, he became able to leave bed, and finally was discharged from the hospital.   There was, however, no demonstrable improvement in his myocarditis, and he was still very short of breath on exertion.

A study of the reported cases and my own experience with theocin lead to the following conclusions:

I. Theocin acts best when there are large serous accumulations, particularly in cardiac or cardio-renal disease, in which there is still considerable secreting tissue left in the kidney.   It is true that in some cases of chronic nephritis a large diuresis has been obtained, but it is probable that in these cases there must have been considerable renal epithelum that was still functionally active.   In advanced chronic interstititial nephritis I should not expect much benefit from the drug; on the other hand, in acute nephritis, Hundt's cases show that very profuse diuresis may be obtained and large dropsical accumulations be made to disappear.   Moreover, Dreser[1] has shown that theocin not only causes a secretion of the water, but also of the dissolved constituents of the urine, especially of the salts.   The salts are increased relatively more after theocin than after ingestion of water; on the contrary, after water the non-electrolytes, such as urea, are increased relatively more after water than after theocin.

2. It does not appear to raise blood pressure appreciably.   For this reason, when blood pressure is low and the heart is dilated, digitalis, either in combination with theocin or given alternately with it, greatly assists theocin in provoking diuresis.

3. While the drug may act in ascites due to cirrhosis of the liver and chronic peritonitis, it often fails.   In alcoholic cirrhosis calomel still appears to be the best diuretic.

4. When theocin acts at all, it acts promptly and in small doses. In two or three hours after the first dose is given there is a very decided increase in the urine, if the case be a favorable one.   The most marked effect is often noticed on the second day, and after the third day or fourth day there is a diminution in the excretion of urine.   The best effects from the administration of the remedy are obtained by giving it for two or three days, and then intermitting for several days

1. Versuche uber die Theocin-diurese am Gesunden Menchen. Berl. klin. Woch., No. 42, 1903.

or a week. In the meantime some other diuretic may be given. The dose for adults is from three to five grains, given in capsule or tablet after food. When small doses fail, large doses are not likely to succeed any better.

5. The drug is not free from unpleasant effects in some cases. Like all caffeine-like bodies it may cause wakefulness, and even excitement, as in cases reported by Minkowski, Stross and Hundt. This may be obviated by giving the evening dose combined with a hypnotic, or, as Stross suggests, by giving the last dose of the drug not later than the middle of the day. It quite frequently provokes nausea, vomiting and even diarrhœa.

6. Theocin appears to act directly upon the secreting cells of the kidney. This is shown by the post mortem examination of the kidneys in Alkan and Arnheim's cases, by the absence of action upon heart or blood pressure, and by the fact that the remedy often fails in chronic nephritis, where there is little secreting tissue left. As it acts upon the renal cells, it is clear that in a given case it may become a dangerous irritant instead of a mere stimulant.

It is also a local irritant upon the gastro-intestinal mucous membrane. This is evident by the frequency with which nausea and vomiting occur, by the occasional diarrhea, which may be mucous as in one of my cases, and by the hemorrhagic erosions present in the cases of Alkan and Arnheim already mentioned. There must also be an action upon the nervous system, but its precise character has not been determined.

It should, therefore, not be given on an empty stomach. Stross says that belladonna will relieve the disagreeable effects of theocin without lessening its diuretic action.

Convulsions following its use have been reported by Schlesinger, Stross, Allard and Hundt, and deaths by Hundt (2) and by Alkan and Arnheim. Theocin is used in such serious diseases which may of themselves terminate in convulsions, that one needs to be cautious in assuming that death is due to the drug. In the reported cases, however, it is probable that theocin was responsible for the convulsions and for the death. That is, that it was the immediate exciting cause.

THE DIAGNOSIS OF TUBERCULOUS CAVITIES IN THE LUNG.

By HERMAN B. ALLYN, M. D.

Dr. J. Kingston Fowler, in 1888, pointed out the portions of the lungs first to be affected in tuberculosis, and the line of march commonly taken by the disease. He believes that the primary site is an inch and a half below the summit of the lung, and rather nearer to its posterior and external borders. Lesions in this situation tend to spread backwards, possibly from inhalation of the virus while the patient is lying down. This line of extension explains why early evidences of tuberculosis may be found in the supraspinous fossæ when the physical signs beneath the clavicles are of doubtful import. From this primary focus, which in front corresponds either to the supraclavicular fossa, or to a spot immediately below the centre of the clavicle, the lesions often spread downward along the anterior aspect of the upper lobe, about three-fourths of an inch within its margin, frequently occurring in scattered nodules. A second and less usual site, he says, corresponds on the chest wall with the first and second interspaces below the outer third of the clavicle. The progress of the disease is downwards, but it rarely penetrates the interlobar septum, only five times in 152 consecutive cases examined post-mortem by Ewart.

In the lower lobe the early deposits are about opposite the fifth dorsal spine, and along the interlobar septum, which is roughly marked by the vertebral border of the scapula when the hand is placed upon the spine of the opposite scapula, and the elbow raised to the level of the shoulder. The opposite lung may be affected with symmetrical lesions of later occurrence, or disease may be found close to the interlobar septum corresponding on the chest wall to the upper part of the axilla.

The portions of the lung first to be attacked are of importance in the present discussion, because cavities usually form first where the lesion is oldest. While Dr. Fowler's statement may be accepted as expressing the usual beginning and line of march of the disease, it

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should be mentioned that one sometimes finds the first evidences of the disease in the fringes of the lung which border the sternum, in the first, second and third interspaces, or high up in the axilla, or in the lappet of lung which covers the heart.

Ewart[1] gives the following figures showing the location of cavities:

At the apices	282 instances.
In dorsoaxillary region	227 "
In mammary region	189 "
In sternal region	61 "
At base	32 "

Clinically one finds cavities most frequently anteriorly from the apex of the lung to the third interspace; posteriorly, in the supraspinous fossa, between the scapulæ and the spine, or beneath the scapula; next high up in the axilla, and, least frequently, at the base. Probably cavities must have reached the size of a walnut before they give distinct physical signs.

In the diagnosis of cavities from tuberculous disease of the lung the history of the patient may be of some service, especially bearing upon the duration of the disease and the quantity and character of the expectoration. While tuberculosis of the lungs spreads much more rapidly in some persons than in others, in the great majority of cases by the time cavities have formed the disease has lasted at least several months, and in many cases more than a year. It is especially in the slowly progressing chronic cases that cavities ultimately form. In acute phthisis and in the pneumonic forms death usually occurs before softening has progressed far enough to result in excavation. Moreover, when cavities exist, expectoration is more profuse, especially in the mornings, or after a change of posture, and is often nummular. I have frequently seen a patient with a cavity at the apex of the lung lie curled up on the affected side. This posture was evidently assumed in order to avoid the distressing cough caused by constant leakage from the cavity into the communicating bronchial tubes. Of course, after the cavity had become filled with pus, coughing would occur in spite of posture; but change of posture to the opposite side, or sitting up to take food, would result in hard spells of coughing, with profuse expectoration. In other cases in which the cavity is relatively dry, the patient may lie preferably on the opposite side. The cough is often exhausting, is followed by much dyspnea, and the sputa are not so profuse.

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[1] Croonian Lectures. 1882

But, aside from the duration of the disease and the character of the expectoration, which after all can only excite suspicion as to the existence of a cavity, the statements of the patient are not of much value in diagnosis. Precise information can be gleaned from the physical signs alone.

Before speaking of the information furnished by the different methods of physical exploration, I wish to insist upon the importance of (1) a thorough examination, and (2) upon the importance of following an orderly progression in developing the physical signs. A thorough examination cannot be made without inspection of the chest, and oftentimes not without inspection of the entire chest uncovered. In women, from motives of delicacy, it is usually best not to bare the entire chest at one time; but even in them in every case in which inspection of the anterior portion of the chest alone leaves the condition obscure, inspection of the posterior and axillary portions can be carried out separately by arranging the clothing so as to cover the parts already examined.

By following an orderly progression, I mean that after the patient's history has been obtained by patient inquiry, examination should proceed by first obtaining all the information possible by a careful and systematic inspection of the chest, and that inspection should be followed by palpation, percussion and ausculation in the order named. Most of the mistakes in diagnosis of chest conditions result from failure to follow patiently a good method, rather than from lack of knowledge; the examiner without looking at the chest, or with only a hasty glance, proceeds at once to percuss and auscult, and speedily reaches a conclusion, which may be correct, but is very likely to be at least quite incomplete. The above method is the one I have endeavored to school myself into following. It has given good results. It is applicable to acute and chronic conditions of the lungs, and, for the matter of that, to the body in general. There is nothing novel in it unless it be insistence upon the importance of inspection.

Taking up the methods of examination then, in the prescribed order, the first is:

INSPECTION. It is surprising how much information can be obtained by a careful and systematic ocular examination of the chest. The first essential is a good light. If the patient be lying in bed with one side toward the window, the opposite side will be somewhat in shadow. This position may be unavoidable, but should be remembered in estimating the amount of expansion. When the patient is lying down the

examiner must be careful to see that he is lying perfectly flat, without having a shoulder or hip raised above the level of its fellow. If this precaution be not taken, no reliable results from inspection can be had. The best posture is a sitting one, with the face toward the source of light. The patient should sit erect, with the arms hanging loosely by his side. He must not lean to one side or the other. The general size and shape of the chest are not of much importance in the present discussion, because tuberculosis attacks all kinds of chests, and is, of course, more frequently found in normally shaped chests, because the normal type predominates. When tuberculosis has progressed to the stage of cavity formation there is always loss of flesh, and not infrequently extreme emaciation; sometimes as much as forty or fifty pounds have been lost before the patient is seen. As the result of this loss of flesh, the cheeks and temples are hollow, the neck thin, the ears prominent, the clavicles, ribs and scapulæ appear to project, and there are depressions in the fossæ above and beneath the clavicles, and above the scapulæ. The fingers are often clubbed. Expansion is usually defective on both sides. To see a difference in expansion often requires close inspection under favorable conditions. The best posture for the patient is a sitting one, with the light falling equally on the two sides, and the examiner either standing behind the patient and looking over his shoulders, or standing to one side, with the eye nearly on a level with the surface of the chest. It is true, one can often see deficient expansion when standing directly in front of the patient, but this is not the best position, and results obtained by it are not to be relied on. Inspection should first be carried out while the patient is breathing quietly, and then he should be asked to take deeper breaths. The region from the nipple to the clavicle is the one where cavities are to be expected, and therefore it should receive particular attention. Deficient expansion in this region is highly significant of disease, for almost always the side that expands less is the diseased side, or is the more diseased if both are affected[1]. There will often be noticed, too, a little less fullness or roundness, some flattening, in fact, where the expansion was diminished. This is often seen better in the second or third interspace towards the sternum rather than just beneath the clavicle. The second interspace often appears wider and

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[1] Since writing the above I have seen a patient with deficient expansion of the left side and cavity at the right apex, the physical signs of which were especially marked in the supraspinous fossa. There possibly, in this case, had been an old pleurasy on the left side and then, after a considerable interval, disease began

deeper than its fellow of the other side. Moreover, the shoulder on the affected side often droops a little, and if the examiner stands behind the patient he will be struck by the lessened up-and-down movement of the shoulder, and lessened motion of the scapula. The supraspinous fossa of the more diseased side often shows distinct depression compared with its fellow.

Sometimes the entire side, anteriorly and posteriorly, shows defective expansion: generally the deficiency in expansion is limited to the apex. In some cases, also, expansion on the affected side may be noticed to be delayed, to lag behind, in point of time, that of the sound side. In only one out of twenty-four cases examined by Sibson with his chest measurer was the expansion greater on the side having a cavity.

Wilson Fox says, apparently on the authority of Walshe, that occasionally a large cavity with thin walls may even cause a slight local bulging, and under these circumstances the expansion may even improve. Fox adds that in some cases also expansion is greater over a at the right apex and progressed rapidly.
cavity than over a consolation. This might be the case if in the consolidation the bronchial tubes were occluded, or the lung covered with a thickened pleura. I have seen bulging occur over a cavity while in the act of coughing; and when the cavity is near the anterior surface of the chest and covered with a very thin wall, the overlying interspace may be seen to flap in and out in respiration. Sibson mentions the fact that some slight recession may be occasionally observed at the commencement of inspiration.

Of course, it is well understood that obstruction of the bronchial tubes and feeble respiratory effort will diminish expansion in a cavity as in any chest condition. But there is rarely complete absence of motion, although the degree of motion is almost invariably less than on the other side, even though that, as is indeed very commonly the case, shows disease at the apex in the stage of consolidation.

Sibson[1] says: "Although the cavity has, over its centre, almost always an inspiratory movement, yet at its margins I have often found the motion abolished, and even reversed. The fourth costal cartilage is often over a consolidated portion of lung, which forms the walls of the cavity. The fourth costal cartilages receded either at the beginning or during the whole of an inspiration in fourteen out of twenty-

1 On the Movements of Respiration in Disease and on the Use of a Chest Measurer. By Francis Sibson. Med.-Chir. Trans., Vol. XXXI, London, 1848.

two cases. The fourth cartilage receded in six out of ten cases on the right side, and in eight out of twelve cases on the left. Of thirty-nine cases of cavities in one lung there were eleven in which the upper end of the sternum fell in at the beginning of inspiration. In many cases, both around and over the cavity the thoracic wall stands still just at the beginning of an inspiration. The lower end of the sternum, and the adjoining sixth cartilage on the affected side, recede, either at the beginning of inspiration or throughout, in about one-half the cases. Here the falling in is due to the elongation of the affected lung through the action of the diaphragm, and its consequent collapse." "If there be diminished motion during tranquil breathing, without any morbid cause, the difference in motion will usually disappear during a deep inspiration."

Sibson further says: "From these observations we may conclude that wherever and whenever an extensive cavity exists in the lung, the respiratory movements are restrained over that cavity, but not obliterated; that the respiratory movement is greater over the centre than over the circumference of the cavity, and that immediately over the circumference the ribs or sternum often recede, either during the whole inspiration or, which is more usual, only at the beginning of it. The firm, tendinous, pleuritic adhesions that surround the lungs in the advanced state of tuberculous disease have more restraining influence over the movements than the disease itself has."

PALPATION. Palpation is less valuable than inspection as a method of diagnosis in cavities in the lung; yet it gives useful information. When the light is defective or the patient lies in such a way that one side is in shadow, the examner's hands may be applied to corresponding portions of the chest, and when the patient is asked to take deep breaths, a difference in expansion is detected by the lessened motion which is then transmitted to one hand. This is a useful measure. Many persons will appreciate much better a motion that is felt than one which is only seen. The fremitus is generally distinctly increased when the cavity is empty, but if there be much fluid in the cavity it may be nearly absent. It is rarely as intense as that over consolidation. Sometimes there is very little difference in fremitus on the two sides partly due to feeble vocal efforts by the patient, and partly to obstruction of the bronchial tubes leading to the cavity. If the patient have a chronic laryngitis no fremitus may be obtainable.

PERCUSSION. Percussion must be practised with extreme care, and with the ears keenly alert for slight changes in sound, particularly in

pitch and quality, or the results will be either negative or positively misleading. The note obtained over a superficial cavity sometimes resembles closely normal pulmonary resonance. But on listening intently one discovers that it has less volume than the former, while it has a higher pitch and lacks vesicular quality. All resonance which is non-vesicular in quality Flint classes as tympanic resonance. Hence the note I am describing would be classed as tympanitic; but it often lacks metallic or musical quality. To my ear it is a muffled sound, without recognizable quality. It seems to be the same sound that West described as "boxy," and Musser and others have spoken of as "wooden tympany." This sound is not characteristic of cavity, however, for it may be heard in pneumothorax, and over the upper lobe of the lung in pneumonic consolidation, and above the level of a pleural effusion. In most cases, however, the percussion note over a cavity is either dull or appears so at first. I find that students set to examine a patient with a tuberculous cavity at the apex nearly always report that there is dullness or flatness on percussion. The reason for this is that the percussion note is so high-pitched, so small in volume and short in duration that it is indistinguishable from dullness, unless the quality of the sound is observed. The quality of the sound is tympanitic, that is to say, there is a slight musical or metallic intonation imparted to it. The tympanitic quality is usually faint, and may not be heard at all unless the patient be instructed to keep his mouth open while percussion is made. Forcible percussion is generally unnecessary, but the pleximeter finger should be applied firmly and struck a sudden, sharp blow. Flint advises that the examiner's ear should be brought into close proximity to the patient's open mouth during percussion; or, what is still better, that the pectoral end of a binaural stethoscope should be brought close to the patient's mouth, when the tympanitic sounds may be appreciated. It is only fair to say that even with these precautions no tympanitic or amphoric quality may be detected. In such cases either the cavity, if superficial, is filled with morbid, fluid contents, or the bronchial tube leading to it is stopped up, or the cavity is more remote from the surface and is surrounded by consolidated lung, which gives its character to the percussion note. West thinks the percussion note is hardly ever tympanitic; but I am sure that when percussion is made with varying force, with the mouth open and closed, at the end of a held inspiration, and in varying postures of the patient, a tympanitic note will often be obtained. But I have found it present one day and absent the next, probably owing to changed conditions

within the cavity, particularly its being filled with fluid contents some-times and relatively empty at other times.   This very changeability in percussion note is suggestive of a cavity.

Two varieties of tympanitic resonance, the cracked-metal or cracked-pot sound and amphoric resonance are, as Flint says, quite distinctive of pulmonary cavity if found within a circumscribed space.   But they are not pathognomonic.   The cracked-pot sound may rarely be de-veloped over consolidated lung, especially when the latter is overlaid with relaxed lung tissue.   West says it may be found even over a pleuritic effusion.   He says the best example of it he ever saw occured over an enlarged heart when the lung was perfectly healthy.

The cracked-metal sound is developed over large-sized cavities, near the surface, and communicating with a patulous bronchial tube.   It is best developed by fairly strong percussion, the striking fingers being allowed to linger longer on the pleximeter finger than in ordinary per-cussion; moreover, the patient's mouth should be open, and percussion should be made while he is inspiring.

Amphoric resonance is obtained over smooth-walled cavities which are empty and are surrounded by rigid non-collapsible walls.

RESPIRATORY CHANGE OF NOTE.   Friedreich has called attention to the heightened pitch of the percussion note during inspiration.   It may cease to be tympanitic if the tension becomes very great.   Wint-rich's change of note consists in the note becoming higher in pitch when the mouth is open, and lower when the mouth is shut.   Accord-ing to Gerhardt's change of note, the pitch would be higher when the patient is sitting or standing than when he is lying down.

AUSCULTATION.   Auscultation furnishes us with some of our most characteristic signs of cavity.   The voice sounds are usually transmit-ted with increased intensity; they may have a hollow sound, or exhibit amphoric quality.   Flint declares that while the vibrations may be very intense they do not present the characters of bronchophony, namely, concentration, elevation of pitch, and nearness to the ear.   These char-acters denote solidification of the lung.   If the word pectoriloquy is limited to mean syllabic reproduction of sounds, so that the ear applied to the chest may hear not only the vibrations, but distinguish the syl-lables and words spoken, it must be a very rare sign.   I have listened to a great many lungs, and do not recollect that I ever heard it but once. I do not think most examiners make any distinction between the repro-duction of sounds with increased intensity on the one hand, and bron-chophony and pectoriloquy on the other.   Flint says: "Articulate words

may be conducted by solidified lung as well as, if not better than, by the air in a cavity. There is, however, a cavernous pectoriloquy easily distinguished from that which denotes that solidified lung is the conducting medium. If the latter be the case, the pectoriloquy is associated with the characters of bronchophony; we may distinguish this as bronchophonic pectoriloquy. If the speech be transmitted solely through a cavity, the bronchophonic characters are wanting. Then the pectoriloquy is truly cavernous. This distinction I suppose to be original; I have for many years been accustomed to teach and illustrate it clinically."

Probably most persons use the word pectoriloquy to cover the reproduction of spoken sounds with increased intensity and nearness to the ear; and some add to this, that the sound has a hollow quality. But the actual hearing of articulate speech by applying the ear over a cavity must occur very rarely. In most instances I suspect that we know what the patient is saying, and so think we can distinguish the words, or else we hear them through the air outside the chest.

It has seemed to me that the whispered sounds were oftener transmitted with increased intensity through a cavity than through solidified lung; though, of course, they may be heard through either medium. One would expect the whispered voice sounds to have lower pitch when heard over a cavity than when heard through solidified lung. Sometimes they are heard with rather startling clearness in contrast with ordinary speech and with the fremitus, which may have been defective. This so-called whispering pectoriloquy I regard as one of the most constant signs of cavity. In fact, the cavity may be mapped out by the area over which whispering pectoriloquy is heard.

The breath sounds over cavities are of much greater importance than the voice sounds. They are cavernous and amphoric breathing and rales.

Cavernous breathing is a low-pitched, blowing sound, without definite quality, with expiration lower pitched than inspiration, and both sounds variable in length. Its chief distinctions are its low pitch and the absence of vesicular, tubular or amphoric quality. It is heard over superficial cavities with flaccid walls. In my experience this sound is rarely heard pure; almost always it is mixed with a tubular sound denoting consolidation, or has joined with it a faint amphoric quality. This admixture of sound is the natural result of the physical conditions which exist around the cavity. Often the cavity is surrounded on all sides by consolidated lung, which imparts a tubular quality and high

pitch to the breath sounds.   Sometimes the inspiratory sound is cavernous and the expiratory tubular, or vice versa.   Or, again, there are often a number of small cavities, communicating or not, some of which have flaccid walls and some rigid; hence we have a sound which is higher in pitch than pure cavernous breathing, and of a faint amphoric quality, particularly on expiration.

When the cavity is large and its walls are rigid, amphoric breathing is heard.   Flint says that an amphoric sound, if distinct, be it never so slight, always denotes pulmonary cavity, provided pneumothorax be excluded.   The sound is analogous to that heard over a football when someone is forcing air into it after it is already full of air.   It is a high-pitched sound of metallic quality.

Laennec has mentioned two cases of cavity in the lung in which metallic tinkling was heard in speaking and coughing; and Stokes[1], who refers to this observation, himself has met with three cases.   In all there were communicating cavities.

Osler refers to a curiously sharp, hissing sound, as if the air was passing from a narrow opening into a wide space.   When the cavity is very large and contains thin fluid a succussion sound may be obtained when the patient is abruptly shaken.   In the rare cases in which a whole lung is excavated, leaving only a thin shell of lung or a thickened pleura, the coin sound may be heard.

The rales which are heard over a cavity that contains fluid are numerous, moist, and variable in size.   Perhaps a listener is most impressed by hearing so many rales, of a size varying from large to small, but all, or nearly all, moist.   One hears moist subcrepitant rales, mucous rales, bubbling and gurgling rales.   They are often heard both in inspiration and in expiration.   In addition there may be squeaking sounds, resembling sibilant rales, and rubbing sounds, which are probably pleural frictions.   I have heard a high-pitched, clicking sound, simulating that heard in a telephone receiver on metallic circuit when the current is opened and closed.   It was heard in inspiration and in expiration.   But the lung sound is not quite so metallic as the telephone sound.   Moreover, the various rales described may have amphoric quality, and even be accompanied by an amphoric echo. After coughing the rales often become resonating.   The heart sounds may be reproduced in the cavity and have amphoric quality, or blowing murmurs of cardiac origin may be heard.

1 A Treatise on the Diagnosis and Treatment of Diseases of the Chest. Philadelphia. A. Waldie, 1837.

CARDIOPULMONARY SIGNS.   A cavity at the apex of the left lung
may result in contraction and the drawing up of the heart, or some-
times its displacement outwards.   Occasionally when this happens a
systolic murmur is heard in the second and third left interspaces.   The
cause may be a kinking of the pulmonary artery.   But, of course, there
may be conjoined disease of the heart and a cavity in the lung.   I have
such a patient under observation now.   There is a marked double
mitral murmur and a systolic aortic murmur, and a cavity at the left
apex.   The aortic murmur was present before tuberculosis developed,
and the heart is not displaced.

To sum up, our most trustworthy signs of tuberculous cavity in the
lung are to be found in deficient expansion and flattening of the chest
wall over the cavity; in a percussion note, which is often a high-pitched
tympany, especially if percussion is made with the mouth open, but
which may be only a muffled sound, or a dull or flat sound; in pectoril-
oquy (so called), particularly whispering pectoriloquy; in breath sounds
which are cavernous, tubulocavernous, tubuloamphoric, or amphoric;
and in a multiplicity of rales, chiefly moist rales, which after coughing
may have resonating quality.

The following cases illustrate the conditions found in examining pa-
tients with tuberculous cavities in the lung:

A. H., black, aged forty-eight years, was admitted to the Philadelphia Hos-
pital August 17, 1904.   She complained of cough, dyspnea, expectoration, loss
of flesh and of strength, and night sweats.   The patient's father was dead of
heart disease, her mother was living and well.   One sister was living and well,
but another living sister had consumption.   The patient had had the ordinary
diseases of childhood, but has otherwise enjoyed comparatively good health.
She had hemiplegia three years ago in this hospital.   She admits moderate use
of alcohol.

The general examination of the patient showed a much emaciated colored
woman, markedly dyspneic, with cough and much expectoration.   The pupils
were equal and responded quickly to light and accommodation.   The tongue
was moist, red, teeth marked along the edges.   The pulses were equal, rapid,
of moderate tension and compressible.   The arteries were slightly thickened.
Inspection of the chest showed marked emaciation, with deep depressions above
and below the clavicles and conspicuous ribs.   There was diminished expansion
on both sides, but less on the right side, and some flattening of the upper por-
tion of the right side anteriorly.   On palpation vocal fremitus was increased on
the right side.   The percussion note on the right side was short and high
pitched, with slight metallic quality, which did not change when the mouth
was opened.   Auscultation disclosed increase of vocal resonance.   The whis-
pered voice sounds were especially distinct.   The breath sounds were obscured
by an abundance of rales of all kinds, mostly large, moist or bubbling rales,

which on coughing had resonating quality. The inspiratory sound when heard was short and high-pitched; the expiratory sound was lengthened, higher in pitch than the inspiratory, while both had amphoric quality. Posteriorly below the angle of the scapula, the percussion note was dull instead of high-pitched tympanitic. The vocal resonance and fremitus over this area were increased, and the breath sounds tubular, but obscured by a great number of sibilant and sonorous as well as mucous rales. Just above and immediately below the clavicle, tympany on percussion is very clear. The voice sounds have amphoric quality on the right side. Among the rales are numerous squeaking sounds which might have been pleural frictions.

On the left side the percussion note was hyper-resonant, with slight dullness over the clavicle and in the suprascapular fossa. Anteriorly vocal resonance and fremitus are less than on the right side. Posteriorly the fremitus is a little more distinct on the left side. There was some tenderness on percussion on the left side. There was marked retraction of interspaces on the left side posteriorly, less in the right midaxillary line. The breath sounds on the left side show rough, rather short inspiration, and prolonged very faint but bronchial expiration. The prolonged expiration is almost cavernous beneath the left scapula posteriorly.

There was some edema of hands, legs and face; almost no change in finger ends. The patient had a hectic temperature ranging from 97 degrees to 102 degrees, a pulse rate ranging from 85 to 130, while the respirations varied from 35 to 55 per minute. The urine was of low specific gravity, 1010, contained a small amount of albumin and some hyaline casts. The bowels were loose, the stools numbering two to four in twenty-four hours. The sputum contained tubercle bacilli.

The patient died September 11, 1904. An autopsy was held the following day. The pathological diagnosis was chronic bilateral adherent pleurisy; fibroid myocarditis; pulmonary tuberculosis with cavity formation; chronic diffuse nephritis; atheroma of the aorta; tuberculous ulceration of the intestines.

Passing over the other organs, the condition of which is sufficiently indicated in the pathological diagnosis, the state of the lungs was reported by the pathologist, Dr. Funke, as follows:

Left lung crepitates throughout, save lower portion of lower lobe, which is irregular in outline, measures four by six inches in diameter, is firm, cuts readily, section sinks in water. The cut surfaces are not refractive; scattered over them are large, gray points, 4 by 8 mm. in diameter, circumscribed, round or oval, denser at the periphery than at the centre and resembling caseation necrosis. The cut surfaces of the remainder of the lung are pinkish-gray in color with black markings and covered with pinkish frothy fluid. The right lung is large, bluish-black in color, does not crepitate, cuts readily, and cut surfaces are grayish-black. There is a cavity at the apex 4 by 10 cm. in diameter, containing a grayish-white substance (caseous). The walls are irregular and made up of caseous substance, and into this cavity many small similar ones open. The lower portion of the upper and the lower lobe has many

cavities, carying from 4 mm. to 1 cm. in diameter, and of similar structure to that at the apex. There are also grayish-white circumscribed areas, 1 to 1.5 c.c in diameter, firm at the periphery, soft at the centre, composed of substance simulating caseation.

The post-mortem findings in this case account very satisfactorily for the physical signs. The notes, however, do not state what was the fact, that the walls of the main cavity at the apex were firm.

W. E. L., white, aged sixty-two years, driver, was admitted August 21, 1904. He complained of cough, dyspnea, expectoration, loss of flesh and strength, night sweats and pain in the chest.

The patient's father had died of consumption, his mother of bronchitis; he had two sisters living and well, one brother killed in war, and one sister died of consumption. The patient had had the ordinary diseases of childhood, and gonorrhea many times. He was given to excessive use of alcohol and tobacco.

He had been ailing for fifteen months. The pupils were equal, dilated, responded to light and distance. The tongue was dry, heavily coated, tremulous. The pulses were equal, of high tension, full, regular, compressible, the arteries thickened.

The patient was a much emaciated man, who said he had lost forty pounds. The clavicles were prominent, the scapulæ winged, the right shoulder was lower than the left. Posteriorly, the right side seemed shrunken. Right suprasternal fossa deeper than left and right lung anteriorly, especially at apex, expands less than left, and as compared with the left there is very slight flattening beneath the clavicles. Vocal fremitus and resonance are increased on the right side down to third rib, and the whispered voice sounds are reproduced with even greater clearness than the ordinary voice. Above the clavicle, over and beneath the clavicle, the percussion note is tympanitic, especially just beneath its middle portion. The musical quality comes out much better with mouth open. Pitch of the note is very high, almost if not quite as high as that of dullness or flatness. The breath sounds are amphoric down to third rib, anteriorly. After coughing there are high-pitched crackling rales somewhat resonating. Below third rib percussion notes is somewhat hyperresonant. Inspiration is slightly bronchial. No change in vocal resonance or fremitus, and only occasional rales. Percussion note above left clavicle is dull, and slightly dull beneath left clavicle. The breath sounds were feeble, and after coughing on deep inspiration there were a few crackling rales.

The temperature was normal from admission except on August 23 and 24. when it rose to 100 degrees, and then fell afterwards to normal and continued so until death.

The sputum contained tubercle bacilli.

F. T., white, aged twenty-three years, a native of Japan; sailor. Admitted September 12, 1904. The patient complains of cough, dyspnea, expectoration, loss of flesh and strength. His father and mother are living and well; two sisters are living and well; three brothers are dead, causes unobtainable; also past medical history unobtainable.

The patient is a poorly nourished young Japanese, who has been complaining for about a month and a half. The tongue is moist and slightly coated. The pulse is regular, of good volume, compressible.

When examined September 16, the chest was moderately emaciated, the left clavicle more prominent than the right. Expansion was diminished over the left lung. Breathing was almost altogether abdominal. Fremitus increased on right, diminished on left side. The left apex and above clavicle, and to a less extent below, has percussion note impaired, high pitched with slight tympanitic quality beneath outer portion of clavicle. From second rib down percussion note is hyperresonant. There is broncophony on the right side above the clavicle and down to second rib. The whispered voice sounds are especially well reproduced and have an amphoric quality. Breath sounds above and below clavicle are amphoric. After coughing the rales have a resonating character. When in the upright position on looking over shoulders, the upper part of right lung seems to move less than the left. Posteriorly the right lung is dull from apex to base, fremitus is feeble. Voice sounds have a slight egophonic character. Breath sounds are feeble, bronchial in character, with numerous high-pitched crackling rales. Breath sounds beneath left clavicle are somewhat roughened. The pupils are equal, they react to light and to accommodation. The tongue is red and moist; the pulses are equal, regular, rapid, of high tension; arteries thickened. The heart sounds regular, rapid, strong, no murmurs. The temperature has ranged between 97 degrees and 99 degrees since admission. The sputum contained tubercle bacilli.

SOME USES OF THE ROENTGEN RAYS IN STUDIES OF THE INTERNAL ANATOMY OF THE FACE.*

By Matthew H. Cryer, M. D., D. D. S.

The study of applied or surgical anatomy by the method of section-izing the head and face has demonstrated that the internal anatomy of the face is not the same in different subjects; that, in fact, in the same individual the two sides of the face often vary markedly. The knowl-edge thus gained has been of the most practical importance to the sur-geon, whether in the special fields of rhinology, ophthalmology, or stomatology. It is, however, often desirable to make a study of the internal anatomy of the face and of the movements of the mandible in the living subject. The pneumatic sinuses and cells vary so much in their shapes, sizes, and outlets that it is impossible to get a definite knowledge of them in a given living subject, or by studying them from sections alone, and it is often important to know the density of living bone and the position of the various structures before undertaking a surgical operation.

During the last decade the employment of the Roentgen ray has come into general use in various ways in both the medical and dental pro-fessions. Its most important service has been in the localization of foreign substances, pathological deposits, fractures and dislocation of bones, the over-calcification of bone, and other pathological conditions, the treatment of various diseases, etc. It has also been employed to a slight extent in the study of normal anatomy. It is along this line of work that your writer wishes to speak particularly.

The movement of the condyloid process within the glenoid fossa and its relation to the eminentia articularis at the various stages of the advancement of the mandible and the different degrees of opening of the mouth can be studied fairly well by the ordinary X ray, but when we reach the pneumatic sinuses and cells of the face it is necessary to

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*Read before Section I, Fourth International Dental Congress, St. Louis, Mo., August 31, 1904.

use the more advanced radiograms.   Those who have worked with so much energy upon this line of investigation are entitled to the greatest credit for the fine results obtained.

ORDINARY AND "STEREOSCOPIC" RADIOGRAMS.

During a visit of the writer to Dublin in the summer of 1903 he had the pleasure of seeing stereoscopic work of this character done by Dr. William ·S. Haughton.   Not until that time had he thought it practicable to make stereoscopic X-ray pictures of the living subject for the purpose of studying the internal anatomy of the face.

Immediately on his return the writer consulted his colleague, Dr. Kassabin, of the Philadelphia Hospital, and under his instructions and with funds supplied by the dental department of that institution, a complete apparatus was constructed for making stereoscopic X-ray pictures of any portion of the body.   Experiments were first made with the cleaned skull, with fairly good results.   Then plates were made from the living subject, but, on account of the density of the tissues of the head and face, the time of exposure necessary was considerably longer than is required for other portions of the body, which made it difficult for the patient to keep perfectly still during and between the two exposures.

Even by studying dried bones with the ordinary X-ray pictures, many interesting facts can be shown.   For instance, a good picture was made of one-half of a cleaned or dried mandible showing the general outline of the bone.   (Fig 1.)   The variations in density are seen, with the cancellated tissue situated between the cortical portions of the bone; the positions and shapes of the roots of the teeth, with the nerve canals, are plainly shown, and the inferior dental tube may also be seen.   The picture also shows an impacted lower third molar.   A stereoscopic picture of this character may be made and examined through the stereoscope, when the internal anatomy can be better seen and studied.

PATHOLOGICAL CONDITIONS.

Fig. 2, a picture of the upper and lower jaws, is from a patient of Dr. Dray, of Philadelphia, to whom I am indebted for this illustration.   In the lower jaw the dental tube is shown extending nearly the entire length of the bone.   The roots of the premolars, the two roots of the first molar, and the anterior root of the second molar are clearly seen, but the distal root is covered by the crown of an impacted third molar. In the region of the impacted tooth there is a cloudiness which indicates that an inflamed condition exists, not only in the bone but also

in the surrounding tissue. This is of vital surgical importance; for instance, in this case the patient was suffering from neuralgia at the time the picture was taken, and gave strong clinical evidence of the inflammatory condition in this region, which was caused by the impacted lower third molar resting against the distal root of the second molar. The absorption of the tissue of the root of the second molar proceeded until the pulp was exposed, thus causing the inflammatory condition noted. Upon the extraction of the second molar both the inflammation and the neuralgia subsided.

MOVEMENTS OF THE MANDIBLE.

By means of numerous X-ray pictures of the mandible, taken with the teeth in normal occlusion, with the mouth open, and in various positions between these two, it has been seen that the head of the condyle changed from one position to another. When the teeth were in occlusion, or nearly so, the condyle rested in the anterior portion of the glenoidfossa, as seen in Fig. 2. When the mouth was slightly opened the condyle was seen to be lowered slightly, resting against the articular eminence. When the mouth was forced wide open the condyle was immediately under and resting against the eminentia articularis. In a few cases it was found slightly in advance of the eminence. In all cases examined where the mouth was only slightly opened, the angle of the jaw moved slightly downward and backward.

MECHANISM OF THE TEMPORO-MAXILLARY ARTICULATION.

If the mechanism of the anatomy of the articulation of the lower jaw be carefully examined, it will be found that the internal, external, and stylo-mandibular ligaments act as suspensories to the jaw, and have a tendency to fix the angle of the mandible when it is carried slightly downward and backward—as when the mouth is partially opened. The muscular fibers of the internal pterygoid and the external portion of the masseter muscles have the same tendency. The condyloid process of the mandible acts as the fulcrum or pivotal point of the bone. The point or fulcrum moves forward with its cushion, the interarticulating fibro-cartilage, mainly through the action of the external pterygoid. While the jaw is being carried forward the mouth can be opened slightly, still retaining the fulcrum or pivotal point at the end of the condyle, but as the mouth is opened wider the fulcrum is gradually changed from the condyle toward a more central portion of the *ramus* and then toward the gonion, the angle probably eventually be-

coming the fulcral point through the partial fixation of the ligaments and muscles before referred to. By the action of the external pterygoid muscle the condyle is drawn forward and the mouth is thrown wide open, with the condyle under or slightly in advance of the eminentia articularis, as is shown in radiograms taken when the mouth was wide open. It is thus that the external pterygoid becomes an opener of the mouth.

The reason for the change of fulcrum or pivotal point may be found in the condition which obtains in the pharyngeal region. If in opening the mouth wide the head of the condyle acted within the glenoid fossa as the only pivotal point, the lower portion of the ramus, with the body of the bone, the hyoid bone, the base of the tongue, and other associated tissues would be carried backward until the soft tissue coming against the postpharyngeal wall would interfere with the functions of that region. By the transfer of the pivotal point this possibility is avoided.

Fig. 3 was made from an X-ray picture taken while the mouth was wide open. It shows that the condyle has been carried well forward with its upper surface resting immediately under the eminentia articularis. This illustration shows other interesting points. The distal border of the ramus is anterior to the line of the vertebræ, which is the normal position even when the mouth is wide open, as was also shown in Fig. 2. This point will be referred to again.

In nearly all radiograms of the face it is noticeable that the roots of the teeth extend no higher than the line of the roof of the mouth. We have here an example of this. No roots are visible above the dark line found above the teeth, which is the roof of the mouth proper. All the tissues below this line belong to the alveolar process and are resorbed in old age, provided the teeth have been lost. The two circular lines seen in the upper jaws are portions of the walls of the maxillary sinuses.

IMPACTED TEETH.

In the lower jaw, the two lower third molars are shown to be impacted. They were extracted, and Fig. 4 gives the views of the left molar after extraction.

Fig. 5 is from another radiogram showing the position of the point of the condyle when the mouth is wide open.

In Fig. 6 the dark line indicating the roof of the mouth may be seen above all the roots of the upper teeth except the upper third molar. This tooth has been impacted, and having become incarcerated near its

place of development has not descended to the line of occlusion. Through its interference with branches of the nerves passing in this region it caused otalgia and other facial disturbances. After extraction of the tooth the trouble ceased. The light space above the dark line shows the position of the maxillary sinus and nasal fossa.

Fig. 7. gives four views of the extracted impacted tooth visible in Fig. 6.

Fig. 8 is from a radiogram of a living subject. It shows very plainly the developing lower third molar with its capsule, a retarded or unerupted second premolar, also the canal or tube passing downward and forward in the ramus. The second molar apparently has four roots; the second premolar seems to have two roots, but this is not the case, the appearance being caused by the incompletely developed apices of the roots. This radiogram was very useful in studying the best method for correcting the malposition of the anterior teeth.

STEREOSCOPIC RADIOGRAMS.

Fig. 9 shows a reduced stereoscopic radiogram of a lateral view of a skull. It was made by Dr. William S. Haughton, of Dublin. In order to appreciate the true value of this picture it must be seen full size through a large reflecting stereoscope. Unfortunately such pictures cannot be observed conveniently upon the screen, therefore you are invited at your leisure to examine this and other radiograms with the stereoscope. Seen in this manner the skull stands out in bold relief, indicating the teeth and their pulp-cavities with their relative positions as they are held in the alveolar process. The upper third molars have been impacted and are resting on a line with the roof of the mouth. There is also an impacted upper premolar resting above the second premolar.

In an ordinary single X-ray picture it would be impossible to localize the true position of these teeth. A stereoscopic radiogram gives a very much better idea; two stereoscopic pictures taken at right angles with each other will locate correctly, especially if the stereographs are as well done as in this case. Unfortunately such a right-angle picture could not be taken of a living subject. The region of the maxillary sinuses is beautifully shown, and their respective walls can be outlined. The inner walls of the orbits, with the ethmoid cells resting between them, can be distinctly seen. The frontal sinuses are well shown, also the floor of the anterior fossa of the brain-case. In examining the center of the skull the right external auditory meatus is the nearest

object. In looking through the squamous portion of the temporal bone the upper part of the petrous portion of the same bone is well defined. Looking through the skull to the opposite side of the brain-case the grooves for the meningeal arteries and the sutures of the brain-case are seen, and, near the base of the ridges, the petrous portion of the temporal bone of the opposite side. The density of the right petrous portion cuts off part of the view of the left internal auditory meatus. At the back of the petrous portion a deep groove is seen for the passage of the lateral sinus. Pages might be written describing what might be seen in this illustration.

Fig. 10 is a vertical stereoscopic radiogram by Dr. Haughton, taken through the base of the same skull as Fig. 10. It is taken at right angles to the other picture. The occluding surfaces of the teeth are shown, also the two impacted upper third molars in line with the other teeth, and the impacted upper premolar is seen to be in a line with the second premolar. By comparing this figure with the last illustration the teeth can be located for all practical purposes. Two pictures taken at right angles to each other, when studied together, will indicate pretty accurately the correct position of any foreign body or impacted teeth. (Figs. 9 and 10 illustrate this point well in regard to the impacted upper teeth). Along the center of the roof of the mouth are two lines showing the two plates forming the vomer and the other portions of the septum of the nose. There is a slight deviation of the septum opposite the space between the second premolars and the molars. The turbinated bones are seen through the roof of the mouth. Passing to the outside of the teeth and looking through the bone at the base of the molar bones and through the tissue surrounding the teeth, the maxillary sinus can be well defined. In passing back of the facial bones the internal structures of the body of the sphenoid bone, the basilar process of the occipital bone, and the petrous portion of the temporal bone can be studied.

Fig. 11 is from the same radiogram as Fig. 10, with the position of the halves changed. That originally on the right side is placed on the left one, and that which occupied the left side is here on the right side. It shows the floor of the three fossæ of the brain-case. The floor of the anterior fossa is somewhat indistinct on account of its thinness, which allowed the X-ray to pass through it; but in so doing it reveals the ethmoid cells and the sphenoidal sinuses. The lesser wings of the sphenoid are seen posteriorly, also the petrous portion of the temporal bone. The mastoid cells are likewise visible.

CASE SHOWING THE VALUE OF X-RAY WORK.

The illustrations following will show the value of the radiogram in investigating. The case is that of a young man now nineteen years old, who fell off a banister when sliding down, at the age of four years, and injured the temporo-mandibular articulation, causing ankylosis of the joint. At ten years of age a double operation was performed for removing the condyloid process for the relief of the ankylosis, resulting in a slight improvement for a short time.

We have in this case a typical example of what the writer referred to in 1898 in describing the effect of permanent ankylosis on the bones affected; that is, that "the abnormal application of forces to the developing bone results in the development of an abnormal form." There is no question that in this case we have the typical abnormal bone as shown in Fig. 12.

Fig. 13 is from a photograph showing a profile view of the patient. Fig. 14 is a front view. Fig. 15 is a view showing the muscles of the anterior portion of the neck in an endeavor to open the mouth. Fig. 16 gives the lateral muscles of the neck during the same effort. The physiological action of these muscles can be studied from these last two pictures. Naturally the anatomist and surgeon would be anxious to know something about the changes that have taken place in the internal anatomy through the muscular action. With this idea in view two X-ray pictures were made, one from each side.

Fig. 17 is from a radiogram taken by Dr. Kassabian. It is made from the right side of the face, and shows that the mandible has changed completely, taking on the character of a typical ankylosed jaw; this process was demonstrated eight years ago, when the writer gave several illustrations demonstrating this point. This and other cases have confirmed the description and the cause as then given. The mental process is drawn back and the gonion downward. In this case the ramus is drawn back beyond a line parallel with the anterior portion of the vertebra. This may be partly due to the removal of the condyloid process in the surgical operation referred to. Through the loss of this process, with the action of the external pterygoid muscle, there is but little to prevent the whole bone from being forced backward, and when it goes back, the hyoid bone, the tongue, and all the tissues associated with it must move backward nearly to or against the postpharyngeal wall.

The picture also shows that the upper and lower third molars are impacted.

Fig. 1.

Radiogram, left side of mandible.

Fig. 2.

Radiogram of a living subject, taken by Dr. Pfahler, showing an impacted third molar, with an inflammatory condition in the surrounding tissue.

FIG. 3.

Radiogram, taken by Dr. Kassabian, of a living subject, showing the position of the eminentia articularis to the head of condyle, when the mouth is wide open.

FIG. 4.

From a photograph of the impacted tooth after
extraction. (Shown in FIG. 3.)

FIG. 5.

Radiogram, taken by Dr. Kassabian, of a living subject, showing the position
of the eminentia articularis to the head of the condyle, when the mouth is
wide open.

FIG 6.

Radiogram, taken by Dr. Pancoast, of a living subject, showing an impacted *upper third molar.*

FIG. 7.

From a photograph of the impacted upper third molar after extraction. (Shown in FIG. 6.)

FIG. 8.

Radiogram, taken by Dr. Kassabian, of a living subject, showing the developing lower third molar with its capsule, a retarded or unerupted second molar, also the dental canal or tube passing downward and forward in the carnus.

FIG. 9.

Stereoscopic radiogram, taken by Dr. Haughton, of Dublin, showing internal structure of skull.
(To be examined with an ordinary prism stereoscope.)

FIG. 10.
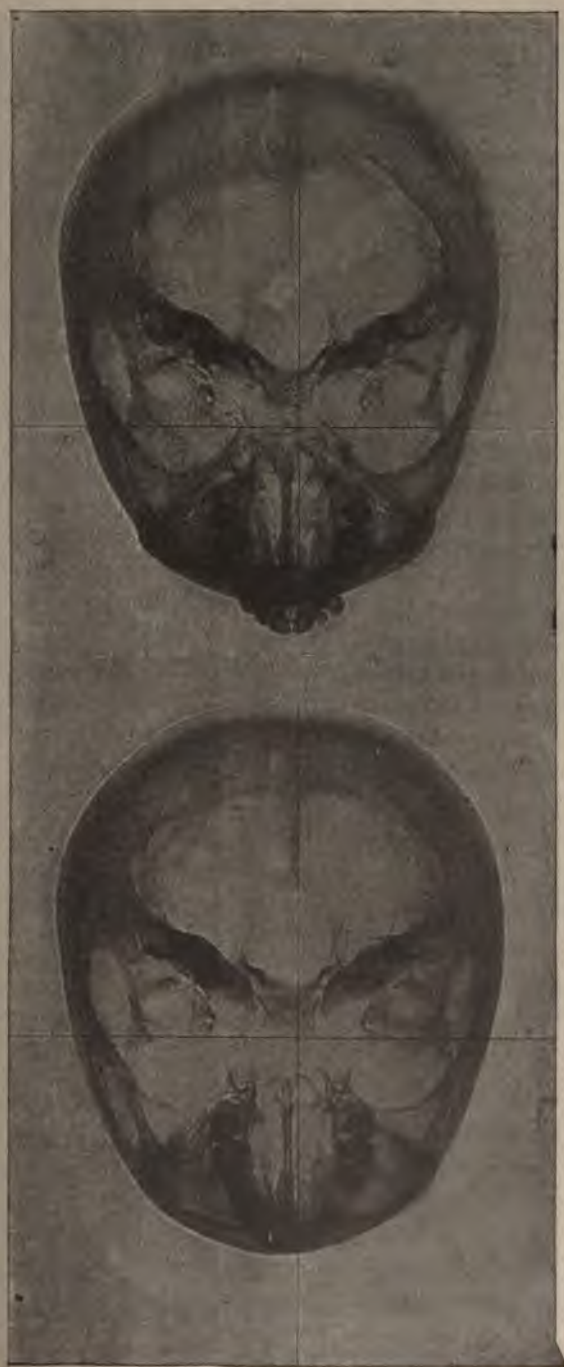
Stereoscopic radiogram, taken by Dr. Haughton, of Dublin, showing a vertical view from the base of a skull. (To be examined with an ordinary prism stereoscope.)

FIG. 11.

Stereoscopic radiogram, taken by Dr. Haughton, of Dublin, showing a vertical view from the vertex. (To be examined with an ordinary prism stereoscope.)

Fig. 12.

From photograph showing the typical shaped mandib'e after ankylosis and true ankylosis of temporamand,bular articulaturi.

Fig. 13.   Fig. 14

Profile view of a typical face of a per-
sc n with an ankylosed jaw.

Frjnt view of a typical face of a per-
son with an ankylosed jaw.

FIG. 15.

Front view of a person with an anky-
losed jaw, endeavoring to open mouth

FIG. 16.

Profile view of a person with an anky-
losed jaw endeavoring to open the
mouth.

FIG. 17.

diogram, taken by Dr. Kassabian, of a living subject, showing the typical
shape of an ankylosed jaw.

· TWO CASES OF TRACHEOTOMY.

By WALTER ROBERTS, M. D.

C. G., white, aged 56, by trade a cement worker, was admitted to the Hospital on the 2d of October, 1903, giving the following history: Father died of "cancer of the stomach." The patient did not know the cause of mother's death. One brother died of dropsy. There was no evidence of tubercular or syphilitic family taint.

Until the present trouble the patient says his health has usually been good. He acknowledges having had gonorrhea four times, but denies ever having had syphilis.

One year ago his throat became very sore, and remained so for several months. He has had several similar but less severe attacks since recovering from the first. Since the beginning of his first attack hoarseness has persisted. Three weeks ago he noticed a small tumor on the·front of his neck. It was in the median line; it caused almost no discomfort, and was of very slow growth. Deglutition was unaffected. Six days before admission to hospital the growth became inflamed and painful, rapidly increased in size, causing both dysphagia and dyspnea.

On admission the swelling extended from two inches below the chin to within one inch of the sternal notch. Its lateral extent was about four inches. The skin covering it was red, edematous and tense. Fluctuation could be faintly elicited. Dyspnea was very marked and deglutition almost impossible. The· patient's general condition was fairly good. Pulse was rapid, but of good force and tension. Arteries were excessively sclerotic. Urine contained albumin and casts.

On the advice of Dr. Hearn the tumor was incised in the midian line, and a large quantity of pus evacuated. The operator noted "some erosion of the tracheal rings, and the appearance in the pus of small pieces of bone." After the evacuation of the pus the patient rested much more easily, the dyspnea and dysphagia both being greatly relieved. Twelve days later, when seen by·the laryngologist, his· condition had again become critical. He lay in a semi-recumbent position, and appeared much distressed. His accessory muscles of respiration were being constantly used to overcome his dyspnea, but his bluish-gray color showed only too plainly he was unable to obtain enough oxygen. Because of his condition a careful laryngoscopic examination was very difficult, but the few fleeting glimpses obtained revealed a reddish edematous swelling on the right side of the lower pharynx, involving the right arytenoid and false cord, pushing the epiglottis toward the opposite side.

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The lumen of the larynx was greatly encroached upon, and a good view of the true cords could not be obtained. The external swelling now appeared as a brawny induration extending over the anterior surface of the thyroid and cricoid cartilages, masking their usual landmarks. A diagnosis of specific perichondritis of cricoid or thyroid, or both, seemed reasonably sure, so the patient was put on rapidly increasing doses of potassium iodide. In view, however, of the distressing dyspnoea which existed it did not seem safe to wait for the constitutional effect of the iodide to relieve it. An immediate tracheotomy was therefore advised. The patient, having consented, was within half an hour placed upon the operating table. After thorough sterilization the line of incision was anesthetized by cutaneous injections of Schleich's fluid. The incision extended by the median line from the upper border of the thyroid cartilage, downward two and one-half inches. No difficulty was met in baring and opening the trachea high up, and a tube was quickly inserted. The patient complained of some pain during the operation, but it was evidently lessened by the injection of Schleich's fluid. Aside from the ordinary irritation primarily incurred when a tracheal tube is inserted, there were no unpleasant complications. The patient's dyspnea was relieved so that he was able to secure much needed sleep.

The next few days witnessed a great change in the patient's laryngeal condition. The edema rapidly disappeared; the swelling subsided, and the epiglottis assumed almost its normal position, yet the patient still had periodical attacks of difficult breathing, which, because of their intermittent character and the absence of any visible obstruction to respiration, were thought to be due to cardiac asthma. The heart's action was very poor. The pulse was weak, rapid and irregular, and the lungs were beginning to fill up in spite of active stimulation. He died one month after the tube was inserted. No postmortem was allowed. The cause of death was said to be arterio-capillary fibrosis.

Now, it is possible in this instance that, had tracheotomy been delayed, it might not have been needed because of the unusually rapid effect of anti-syphilitic treatment. On the other hand, a few hours' delay might have proven fatal, because of the extensive intralaryngeal infiltration and edema. Resort to tracheotomy seemed the much safer course to pursue, and as it was done with local anæsthesia, and gave the patient no serious shock and a great deal of subsequent comfort and sleep, the operation certainly greatly increased the patient's chance of recovery. The tracheal tube might have been removed before his death, because the laryngeal condition for which it was inserted had almost entirely cleared up, but on account of his poor general condition and the periodical attacks of dyspnœa, it seemed wiser not to do away with the safety valve.

Case II.—P. F., an Italian laborer, 20 years old, was admitted to the hospital May 5th, 1903. He gave the following history: Father, mother, two brothers and four sisters were living and well. There had been no deaths in

his immediate family. Until attacked by his present trouble health had always been good. Four months before admission he first noticed cough, and some difficulty in breathing, which progressively increased. At first by putting a little extra force in his inspiratory effort he got along very comfortably, but gradually the difficulty increased until the last extra exertion brought on severe dyspnea. He did no work, and spent much of his time in bed.

On admission his condition was most distressing. The anxious face, cyanosed lips, protruding eyes, engorged cervical veins and rigid prominent muscles of neck and chest, with deep supra-clavicular and supra-sternal spaces showed very plainly the effort he was making to secure sufficient oxygen. Respirations were rapid and inspiration was accompanied by a peculiar wheezing and crowing sound in the larynx. He was greatly alarmed, and after every ten or a dozen breaths he tossed frantically from side to side, imploring aid. His pulse was rapid, small and easily compressible. Pupils were equal, widely dilated and reacted normally to light and distance. A careful physical examination of heart, lungs, abdomen and extremities failed to reveal anything abnormal.

When first seen by the laryngologist, twenty hours after admission, the patient was rapidly approaching a state of exhaustion. His pulse was rapid and almost imperceptible; cyanosis was very pronounced, and the patient was developing a quietness and indifference bordering on collapse. An attempt was made to insert an intubation tube, and for a little while that one remained in place he was much relieved. As, however, the tubes at hand were all children's sizes, and were always quickly expelled from the larynx, it was decided to perform tracheotomy at once. As everything was already prepared for the operation, he was immediately placed on the table in a semi-recumbent position, with head well thrown back. His dyspnea became at once alarming when placed flat on the table. After careful sterilization the field of operation was anesthetized by cutaneous injections of Schleich's fluid. The low operation had been thought preferable because of the chronic nature of his trouble and the probability of the tube having to be worn for a long time. The incision, which, by the way, caused the patient almost no pain, was a median one, extending from the lower border of the thyroid cartilage to upper border of the sternal notch. However, before the trachea could be bared and opened below the isthmus, the patient ceased breathing, cyanosis became extreme and the engorged cervical veins deluged the wound with dark blood so that it was impossible to get a clear field of operation. After a few futile attempts to insert the tube as had been intended, the operator was forced to hastily extend the incision upward and open the trachea in its more superficial position, just below the cricoid cartilage. The high operation was easily and quickly accomplished, so that the patient a moment later was taking normal deep breaths. After waiting a few minutes until he was in thoroughly good condition, the tube was changed to the low position, as first intended. This was done because the trachea was already exposed below the isthmus and because in this class of cases the general consensus of opinion is greatly in favor of the low operation.

With the exception of some fever (from 100 to 102 degrees) for three or four days, and quite extensive emphysema of the face, neck and shoulders for about one week, convalescence was uninterrupted. Through a misunderstanding, the tube. after being worn about one month, was removed and the sinus allowed to close. The patient immediately began to suffer from dyspnea, and was unable to sleep at night without the terrific snoring which characterizes these cases, and resulted in the other ward patients keeping him awake by hurling missiles at him. a form of persecution which gave him much annoyance. The tube was therefore reinserted, and still remains in place, almost eleven months after his admission to the hospital. He now enjoys perfect health, and has acquired much skill in occluding the tube with his finger when he desires to articulate.

A laryngoscopic examination shows abductor paralysis of the left cord, with fixation in the median line. The right cord also shows impaired motion, adduction being good, but the power of abduction being only partially preserved. This condition did not, of course, interfere with articulation, but greatly interfered with inspiration.

It seems probable in this case that the patient will have to wear the tube permanently, because it has been so far impossible to find any definite cause of the trouble. As is usual in these cases, the patient was put on rapidly increasing doses of potassium iodide, although no history of specific trouble could be obtained, but the result was negative.

A careful search has been made for some evidence of pressure on the recurrent laryngeal nerves without result. Aneurysm, enlarged glands (lymphatic, cervical or bronchial), thyroid growth, disease of the apex of the lung or its adjacent pleura, have each been discarded as sources of pressure. The possibility of rheumatic perichondritis of the arytenoids has been thought of, but the absence of other rheumatic manifestations, the inefficiency of anti-rheumatic remedies and the absence of pain seems to preclude such a theory.

There is very little, also, to support the idea of its being of central origin; because if it were there would probably be some other evidence of central trouble. Lead poisoning occasionally gives us laryngeal paralysis, but it always affects the adductors, just as it always affects the extensors of the forearm.

A myopathic origin of the trouble is at present the only tenable theory, resulting probably from some traumatism, although we can obtain no history of injury.

The treatment seems now to have narrowed itself down to strychnia and galvanism, which have been proven by our clinicians to be the most useful, but with a small chance of giving relief.

The writer is indebted to Dr. Thomas F. Duhigg for his assistance in obtaining histories of both these cases.

THE PATHOLOGY OF CEREBELLAR TUMORS.*

By T. H. WEISENBURG, M. D.

It is not the purpose of this paper to consider minutely the histology of cerebellar growths, as this information can be obtained in any text-book on neurology. The pathological aspects of the various conditions which give the symptoms of cerebellar tumor will be considered, especially in a surgical sense.

It is difficult to make a satisfactory classification of such a subject, but the following plan will be adopted:

1. The ordinary tumors in their order of frequency, as glioma, tuberculoma, cysts, and so forth, of the cerebellum itself.

2. Growths of the surrounding regions giving cerebellar symptoms, as of the fourth ventricle, medulla oblongata, pons, and corpora quadrigemina.

3. Growths in parts besides those mentioned, giving cerebellar symptoms.

4. Abscess of the cerebellum.

5. Internal hydrocephalus, with symptoms of cerebellar tumor.

6. Cerebellar symptoms without any lesions.

7. Lesions of the cerebellum without any symptoms.

Excellent statistical studies of the frequency of the cerebellar and other cranial growths have been made, and without the desire to add to the already voluminous literature on the subject, it has been thought advisable to give a brief report of the brain tumors now in the neuro-

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pathological laboratory of the University of Pennsylvania, which is under the direction of Professor William G. Spiller. This collection has largely been accumulated in the last three or four years, and is from the services of Dr. Mills and Dr. Spiller and from the Philadelphia General Hospital, although in a number of instances specimens have been obtained from other sources.

Tumors of the cerebral cortex and subcortex............................. 27
Cerebellar tumors 9
Tumors of the brain stem... 9
Tumors implicating both brain and cord................................. 4
Tumors of the cerebral cortex and subcortex:
  Sarcoma 13
  Fibrosarcoma 2
  Endothelioma 4
  Glioma 3
  Gumma 2
  Carcinoma 1
  Adenoma 1
  Tuberculoma 1

Cerebellar tumors:
  Glioma 5
  Sarcoma 1
  Fibroma (in the cerebellopontile angle)........................ 3

Tumors of the brain stem:
  Pons: Tuberculoma 2
   Glioma 1
  On the pons and medulla oblongata: Sarcoma.................... 1
  On the medulla oblongata: Chondrosarcoma..................... 1

Within the fourth ventricle: Sarcoma.................................... 2
  On the corpora quadrigemina: Fibroma.......................... 1
  Within the corpora quadrigemina: Glioma....................... 1

Tumors of the brain and cord: General sarcomatosis, with large tumors, especially in the cerebellopontine angle.............................. 4

  Sections of at least seven other brain tumors were not considered, because definite knowledge of the location of the growths was lacking.
  According to statistics tumors of the cerebellum are less frequent than of the cerebrum. Schuster, in a statistical table of some thou-

sand cases of brain tumor, found 21.6 per cent. to be cerebellar. When the relative size of the cerebellum and the cerebrum is considered, it is probable that new growths are more frequent in the former.

Tuberculous growths are more common in persons below the age of twenty years, while glioma, sarcoma and cysts of various kinds are more frequent in the adult. The frequency of fibroma, especially of the acoustic nerve, is becoming better recognized. Syphilitic tumors of the cerebellum are rare. Of the other forms of new growths, as carcinoma, lipoma, angeioma, psammoma, and dermoid cysts, there are very few instances in the literature.

The lateral lobes of the cerebellum, possibly because of their greater size, seem to be more frequently the seat of tumors than the middle lobe, although writers differ upon this point. Tumors within the middle cerebellar peduncle are rarely found, although a tumor within this peduncle is present in one of the specimens in the laboratory. Growths in the anterior and posterior cerebellar peduncle are also uncommon. The angle formed by the cerebellum, medulla oblongata and pons is a favorite seat for new growths, these tumors growing either from within or upon the acoustic, facial or trigeminus nerves, and frequently are fibromata.

TUBERCULOMA.—In 152 tuberculous brain tumors collected by Allen Starr, occurring in childhood, 47 were in the cerebellum. In the adult they are found with equal frequency in this region and in the pons and the cerebral cortex. They are nearly always multiple, and secondary to a tuberculous process elsewhere in the body. A tendency to symmetrical arrangement is also observed (Oppenheim). Their size varies from a small nodule to a large fist. Macroscopically, it is hard to distinguish a tuberculoma from a syphiloma. Both have poor blood supply and a tendency to caseate, the tuberculous growth to pus formation. Again, both have a tendency to grow from the meninges, although the tuberculous growths are found in the substance of the brain, and may have granulation areas and miliary tubercles about their border. It must be recalled, however, that syphilitic tumors of the cerebellum are rare.

The growth of a tubercle may be either rapid or slow. Tuberculous tumors may give no clinical symptoms. This has been explained by the slowness of the growth, the cerebellum gradually accommodating itself to increased pressure. Very recently, however, Raubitschek was able to demonstrate the persistence of the axis cylinders in tuberculous growths by Bielchowsky's method. This, as in multiple sclero-

sis, explains the persistence of function. Surgically, it is not advisable to operate upon these growths, as they are multiple and cannot be removed.

GLIOMA.—The cerebellum is a favorite seat for glioma. Five of our cerebellar growths were of such nature. Gliomata are almost always primary and single, although metastasis has been noted. The tumor may be as small as a cherry or as large as a hen's egg; it always grows from the brain substance itself, and is of slow growth. It is not sharply defined, but infiltrates into the brain substance, and it is difficult to tell it from normal brain tissue, although sometimes there is an increased consistence to pressure and there may be a slight swelling. The border zone of the tumor may present an increased number of blood vessels and there may be islets of new tissue.

Gliomata may be hard or soft, depending upon the excess of cells or fibrils, and have a yellowish white or reddish appearance. Cystic formation is very common, some authors believing that the whole tumor mass may disappear, leaving nothing but a cyst wall, and that it is necessary to examine microscopically the capsule to determine the gliomatous origin. Cysts form in the neighborhood of these tumors, and the surgeon may tap one of these cystic formations, believing it to be the only lesion present.. It is wise, as Oppenheim has pointed out, to remove always a part of the cyst wall for a microscopic examination. · The fluid inside of these cysts may be whitish or bloody in character. Fatty, hæmorrhagic and myxomatous changes occur in gliomatous tumors.

Microscopically it is difficult to distinguish a glioma from a sarcoma unless a differential stain has been employed. There is some doubt as to the simultaneous occurrence of glioma and sarcoma, the so-called gliosarcoma, some authors believing this to be impossible, as the former is of ectodermal and the latter of mesodermal origin. Others believe that by metaplastic processes a sarcomatous structure may develop from neurogliar tissue. According to certain pathologists, a gliosarcoma should only be diagnosticated where a sarcomatous, perivascular cellular mass is found within a glioma.

It can readily be understood from the slow growth and from its infiltrating character why clinical symptoms of brain tumor do not always appear, or not until late in the disease. Surgically, it is difficult, or even impossible, to remove completely such a tumor. Sections made from the specimens removed at the operation in Cases I and II of Dr. Mills and Dr. Frazier showed a glioma in each instance.

SARCOMA.—This form of brain tumor is about as common as the glioma, although in our experience sarcomata have been more frequently found. The growth may be small, flat or nodular, or may be of large size. It is primary and usually solitary. Sarcoma always grows from the meninges, periosteum, or cranial bones, or from the pial covering of the blood vessels. It never grows from the brain substance, and therefore, unlike glioma, it often compresses the brain tissue and may be distinct from it, although not infrequently it infiltrates the latter. Even when growing within the brain a distinct margin sometimes may be found, due to the softened area surrounding it. It is usually harder in consistency than a glioma, and is slow in its growth.

The tumor may soften or caseate. Myxomatous, hæmorrhagic and cystic changes are not uncommon. Cystic changes are especially common in the cerebellum, not only in sarcomata, but also in gliomata. In one of Dr. Spiller's cases small sarcomatous masses were found in the walls of a cyst. If the fibrous tissue is very marked we have a fibrosarcoma.

Sarcoma may manifest itself as a diffuse multiple sarcomatosis. In an excellent article Spiller recorded two such cases and called attention to the rarity of this disease. He quotes Schlesinger, who subdivided the tumors under the head of multiple sarcomatosis into

(a) Diseases of the nervous substance and meninges.

(b) Multiple sarcomatosis of the membranes without sarcoma of the brain or cord, when it is (1) in the form of multiple small tumors, or (2) a diffuse sarcomatous infiltration of the membranes.

Of twenty cases recorded by Schlesinger, fourteen implicated the brain and cord or their membranes. "In nine of these fourteen cases cerebellar tumor was found, and in three the medulla oblongata was affected. It appears, therefore, that when the brain or its membranes are implicated in sarcomatosis, usually the structures of the posterior cranial fossa are affected, and that in about two-thirds of the cases a tumor of the cerebellum is found."

In Spiller's first case a large sarcoma was found in the left cerebellar lobe, and in his second case a tumor was found in each cerebellopontile angle, the larger one being on the left side, as shown in Fig. 1. Tumors were also found in this case in the Gasserian ganglia, pituitary body, floor of the fourth ventricle, right internal auditory meatus, and right jugular foramen, and numerous small tumors were found in the pia of the spinal cord.

It may be impossible, as in Spiller's second case, to make a correct diagnosis in sarcomatosis of the brain and of the pial covering. Extensive alteration may cause few clinical symptoms, because the soft

FIG. 1.

Sarcoma in left cerebellopontile angle.   Small tumor in right cerebellopontile angle does not show up in photograph.

tumor masses grow in the pia and about the cranial nerves and spinal roots, and may produce little or no compression or destruction of the nervous tissue. Spiller insists upon the importance of remembering this fact, for when evidences of sarcomatosis are found, the case is an inoperative one.

Occasionally the process may invade the brain substance, while the nerve roots may escape. It is, according to Spiller, because of this escape of the nervous tissue in many cases that a correct diagnosis of the extent of the process may be impossible.

The infiltration of the pia may resemble that caused by syphilis or tuberculosis. Again, as in Nonne's case, the macroscopical examination may be normal.

Sarcomatous tumors, according to Westphal, occur more often in the young. When tumors occur in the posterior cranial fossa they have a predilection for the cerebellopontile angle and the internal auditory meatus.

Isolated sarcomata, whether of the cerebellum or of any other region of the brain are, next to fibromata, among the most favorable forms of tumor for surgical removal. Of course the question of multiple sarcomatosis must always be carefully considered when deciding upon operation. With regard to surgical procedure the hard, non-infil-

trating sarcomata are the most favorable. Experience shows, however, that a sarcoma which appears to be infiltrating when the brain and tumor mass are first exposed, is often separable from the brain substance.

SYPHILITIC GROWTHS.—Gummata are rarely found post mortem, although they are possibly the most common cranial growths. They are especially rare in the cerebellum. The resemblance between this growth and tuberculoma has already been discussed. In a recent article Mills recorded two cases in which the diagnosis of a tumor in the cerebellopontile angle was made. At the necropsy no tumors were apparent, but microscopically in the first case a diffuse syphilitic basal meningitis was found and in his second case, besides a meningitis at the base, there were numerous areas of softening throughout the brain, extending from the gray into the white matter. These areas of softening were yellowish red in color, soft in consistence, and were well defined from the surrounding brain substance. Microscopically there was an intense round cell infiltration about the blood vessels and within the. tissues.

These cases illustrate well the nature of syphilitic new growths. It is well known that a syphilitic basal meningitis, or meningoencephalitis, may attack any cranial nerve or combination of cranial nerves, but, according to Mills, they show a predilection in favor of the nerves from the second to the seventh inclusive, of these the fifth perhaps most frequently escaping.

Syphilitic growths are rapid in development, but it must be remembered that the various pathological conditions which lead on to these growths have been long present.

FIBROMATA.—These tumors are rare, but they are relatively more frequent in the cerebellum than in the cerebrum, and especially in the cerebellopontile angle. This has been better rcognized within the last few years, because of the relatively successful surgical removal of tumors growing in this area.

A fibroma invading the cerebellopontile angle may be only a part of a general neurofibromatosis; this, however, is rare, or, what is more common, it may be the only expression of this process, a central neurofibromatosis. The growth is slow, and generally is unilateral, although in rare instances it may be present on both sides. Henneberg and Koch pointed out that these tumors are more often found on the left side in the ratio of three to two. In the cases reported by Dr. Mills, the pathological reports of which are here given, the neo-

plasms were on the left side. In an examination of the tumors situated in the pons, medulla oblongata and the cerebellum, we found that the majority were on the left side. It seems, therefore, that tumors of these areas are more prone to grow on the left side.

The fibromata may be as small as a cherry or the size of a large egg. The growth is firm, hard, nodular and has a distinct capsule surround· ing it. It is loosely attached to the brain by an atrophic nerve trunk, a few blood vessels or a meningeal process, and these attachments may be easily ruptured. These tumors are in organic relation, especially with the acoustic nerve, and more rarely with the trigeminus and facial nerves. They nearly always grow from the endoneurium and rarely from the peri- or epineurium. Consequently we may find medullated nerve fibres either in the periphery of the tumor or in its centre. As a rule, if the process involves the other cranial nerves, we have a general neurofibromatosis.

The fibroma may undergo a cystic, fatty or myxomatous degeneration. Very often in its advanced stages it may assume a sarcomatous tendency. Histologically we find a connective tissue structure with entire absence of nerve elements, except sometimes a few medullated nerve fibres either in the periphery or its central part. These are remnants of the nerve on which the fibroma grows and should not be mistaken for a part of the new growth. Most writers persist in calling these tumors neurofibromata. The best example of a true neurofibroma is the amputation neuroma, therefore, a fibroma would be a better term for these growths.

In a number of cases of fibroma of the acousticus there were associated cortical changes. Henneberg and Koch reported hyperplasia and hypertrophy of the glia cells of the cortex, especially of the deeper layer, and in another case endothelioma and psammomata of the dura mater. Fraenkel and Hunt made a similar observation. In another case reported by these authors there were protrusions and minute herniæ attached to and sometimes perforating the dura. Histologically these consisted of large cells of the spindle type and of glia cells.

At times the fibromatous process may involve the whole of the intra· cranial portion of the acousticus. In a case of Alexander and v. Frankl-Hochwart, an anatomical examination of the labyrinth showed a degenerative atrophy of the cochlear nerve, the spiral ganglion, the organ of Corti, and the striæ vasculares.

These tumors compress greatly the lateral lobes of the cerebellum, the pons, and the medulla oblongata. In one of Dr. Mills's cases the

(7)

temporal lobe was compressed. Because of the slow growth and the nature of the tumor, clinical symptoms may not appear at all, or only late in the disease. In one of Dr. Mills's cases there were no symptoms of such a growth, the tumor being found at necropsy.

The following pathological report of two cases of fibroma in the left cerebellopontile angle are from the service of Dr. Mills. They are referred to by him in the discussion of tumors of the cerebellopontile angle, the first extensively, the second briefly. The clinical report of the second case is appended:

CASE I—A tumor (Fig. 2) 3 cm. wide and 2½ cm. in length anteroposteriorly was found in the left cerebellopontile angle, compressing slightly the forward part of the left lateral lobe of the cerebellum and the under surface of the temporal lobe. The pons and medulla oblongata were not compressed. There was marked internal hydrocephalus. Microscopical examination showed it to be a fibroma.

FIG. 2.
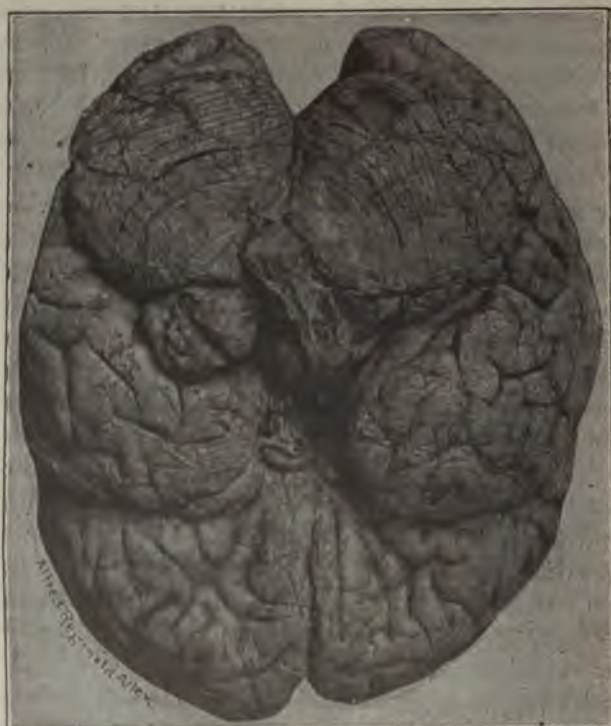
Fibroma growing from the left acoustic nerve compressing slightly the left lateral lobe of the cerebellum and the lower surface of the left temporal lobe.

CASE II.—A tumor (Fig. 3) 5 cm. wide and 3 to 4 cm. in length anteroposteriorly was found in the left cerebellopontile angle. The tumor was very firm and nodular, and compressed considerably the under surface of the left lateral lobe of the cerebellum and the left side of the pons. At no place did the tumor infiltrate the brain tissue, and it could be entirely enucleated. Microscopical examination showed it to be a fibroma.

CYSTS.—Cystic degeneration of gliomata and sarcomata is very common, especially if they are situated in the cerebellum. This has been discussed when speaking of sarcoma. Other tumors, as fibroma and carcinoma, are prone to undergo cystic change, but more rarely. Some authors believe that the whole tumor may disappear and only

FIG. 3.
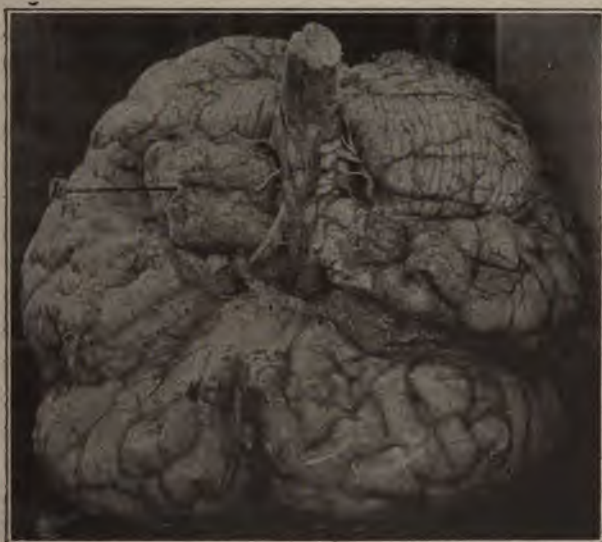
Fibroma growing in the left cerebellopontile angle compressing the lower surface of the cerebellum and the left side of the pons.

a cyst remain. In other cases only a microscopical examination will detect a small tumor mass in the walls of the cyst. Spiller has pointed out that the wall of a congenital cyst may be the starting point for a neoplasm, and this possibility should not be ignored.

The most common cystic changes found in the brain are due to parasitic growth, the cysticercus cellulosæ and the ecchinococcus. These, however, are so rare in this country that they will not be here discussed.

Cysts due to traumatism are recorded, but their genesis is by no means clear. Congenital cysts are rare. They are probably offshoots of the primary cerebral vesicles. Dermoid cysts have been recorded as occurring in the cerebellum in several instances.

CARCINOMA.—Carcinoma of the cerebellum is rare. This form of neoplasm is always secondary and grows from the dura or in the substance of the brain. Saenger recorded infiltration of the cerebral pia with cancer cells. The possibility of toxic changes must be considered, as it is not improbable that through intoxication caused by a carcinoma elsewhere in the body, symptoms of brain tumor may be present.

OSTEOMA.—In several instances an osteoma has been described as occurring in the cerebellum. It is probable that these growths are not primarily of bone formation, but are the result of calcification of such tumors as tuberculoma, fibroma, sarcoma, and even lipoma. Other neoplasms, as adenoma, lipoma, angioma, psammoma, and cholesteatoma are hardly ever found in the cerebellum, so they will not be discussed. It must also be remembered that aneurysm of the vertebra or basilar artery may give symptoms of cerebellar growth.

THE INFLUENCE OF CEREBELLAR GROWTHS.—At the operation when the dura is removed there is nearly always increased tension and the parts may bulge. The surface of the cerebellum is flat and the fissures may be abolished. The pia covering the neoplasm is generally poor in its blood supply. The tissues near the growth may be softened. If the tumor is in the lateral lobe of the cerebellum it may compress the fifth, seventh and eighth cranial nerves. The occipital lobes may even be compressed through the tentorium. If the cerebellar tumor is large it may compress the corpora quadrigemina, pons and the medulla oblongata, and these structures may be flattened or deformed. Pressure may also be exerted upon the cranial nerves at the base of the brain. The influence of cerebellopontile growths upon surrounding structures has already been discussed.

The cerebrospinal fluid is almost always increased in cases of cerebellar tumor, because pressure is exerted upon the communication between the lateral ventricles and the fourth ventricle, or upon the veins of Galen, which convey the blood from the choroid plexus to the sinus

rectus.   Because of this internal hydrocephalus undue pressure is brought to bear upon the different cranial nerves, as the optic and olfactory.   The optic chiasm may be directly compressed through pressure from the third ventricle.

Alterations in the posterior roots and the posterior columns of the spinal cord have been recorded as occurring in conjunction with tumors of the brain.   Such changes have been also found by Dr. Spiller.   According to Batten and Collier, they are especially present in cerebellar growths, and are due to the increased pressure.   Dinkler and Becker believe that toxic or nutritional changes are at fault.

TUMORS OF THE FOURTH VENTRICLE, MEDULLA OBLONGATA, PONS AND CHOROID PLEXUS.—It is not in the province of this paper to consider in extenso neoplasms of these areas, but inasmuch as these growths sometimes give symptoms of cerebellar involvement, they will be briefly considered.

Tumors of the fourth ventricle and of the medulla oblongata may give no appreciable clinical symptoms.   They may either be cystic or hard, and may grow in the substance of the medulla oblongata.   This is especially true of parasitic and congenital cysts.   Hunt recorded two congenital cysts of the fourth ventricle, in which the cerebellum was greatly compressed and yet there were no cerebellar symptoms.

Neoplasms growing within or upon the corpora quadrigemina nearly always compress the middle or the lateral lobes of the cerebellum. They also cause internal hydrocephalus.   Two such specimens are in our collection.

Tumors of the pons may cause pressure symptoms upon the cerebellum, or the growths may involve the middle cerebellar peduncles. Growths of the choroid plexus, as in a case of Arnold's, where a psammoma of the size of an apple was found, may compress the pons, medulla oblongata and the cerebellum.

TUMORS IN THE CEREBRUM GIVING SYMPTOMS OF CEREBELLAR GROWTH.—Ascherson recorded an instance in which a sarcoma was found in the centrum ovale of the left side in the upper motor area. This neoplasm measured $1\frac{1}{2}$ by $2\frac{3}{8}$ inches, and could easily be enucleated.   It caused a compression of the lateral ventricle in the same side.   This author cites Raymond as having recorded an almost similar case.   Ascherson is of the opinion that the cerebellar symptoms were due to pressure exerted through the lateral ventricle, and he emphasizes the importance of early symptoms before those of pressure are apparent.   In this connection the fact that tumors of the post-

parietal cortex or subcortex, may give unilateral ataxia should be borne in mind. The diagnosis between post parietal and cerebellar tumors is given in the paper of Dr. Mills.

ABSCESS.—Chronic otitis media is the most frequent cause of abscess in the cerebellum. It may be due to such other causes as traumatism or may be a part of a general pyæmic process, but these instances are uncommon. The abscess occurs mostly in the anterior outer part of the cerebellum, and is generally single. It may involve also the adjoining temporal lobe. The abscess may be encapsulated or it may keep on forming pus. Surrounding it, œdema and softening of the brain substance are found. Pus may travel along the facialis and acousticus, and cause extradural abscesses. Hydrocephalus, sinus thrombosis, and thrombophlebitis are frequent complications.

INTERNAL HYDROCEPHALUS.—This condition is most often caused by a brain tumor, but it may be congenital or acquired. Spiller recorded an instance in which the symptoms were those of cerebellar tumor, and at the necropsy the cerebral ventricles were much distended, but the fourth ventricle was of normal size. The aqueduct of Sylvius was almost entirely occluded when examined, and the occlusion must have been congenital or have occurred early. Byrom Bramwell recorded a similar case, but here a localized meningitis caused a closure of the foramen of Magendie. The possibility of internal hydrocephalus should always be kept in mind when a cerebellar growth is considered.

SYMPTOMS OF CEREBELLAR TUMOR WITHOUT LESIONS.—In a very important paper, Nonne called attention to those cases in which the majority of the symptoms of brain tumor were present, and in which, either spontaneously or under merclrial treatment, the symptoms disappeared, leaving, perhaps, a partial optic nerve atrophy. There was no reason in any of the eight clinical cases he reported to suspect syphilis.

He also records three similar cases with necropsy, in two of which symptoms of a tumor in the posterior cranial fossa was diagnosticated. At the necropsy in the first case, internal hydrocephalus was found. On the floor of the fourth ventricle, opposite the posterior medullary velum, there was a hard, long, yellowish white structure, which obstructed the flow of the cerebrospinal fluid. Microscopically this was found to be a fibroma. In his second case, internal hydrocephalus was also found, this being caused by a sarcoma of the ependyma of the floor of the fourth ventricle.

He further records three cases with necropsy in which there was no internal hydrocephalus. Nonne also reports cases of internal hydrocephalus which gave largely basal symptoms due to various causes, and which terminated either in death or recovery. He leaves us in doubt as to what is the cause of such a condition.

Dr. Spiller has very kindly given me the records of such a case occurring in his service:

Woman, 44 years of age, domestic, past history unimportant. Two and one-half years ago the patient began to have violent headache in the left cerebellar region. This headache became more severe and became localized in the left parietal region, where there was also great tenderness to pressure. She had an ataxic, drunken gait, and would fall to the left or backward when walking. Extreme vertigo was also present, especially when she was lying on her left side or walking. Power was diminished in the lower limbs, and sensation was also somewhat impaired. The patellar jerks were absent. There was no albumin in the urine.

Dr. Roberts operated at the point of great tenderness in the left posterior parietal region. There was nothing abnormal found and the brain appeared to be in a healthy condition.

The patient's symptoms steadily disappeared, the pain in the head became better and in a short time she seemed almost well.

Another case was studied by me repeatedly.

This woman was in the nervous wards of the Philadelphia General Hospital, in the service of Dr. Spiller. She was 52 years of age, denied venereal history, and her past history was unimportant. Five years ago she began to have violent vertical headache, which has persisted more or less since. One year ago she began to have objective vertigo and convulsions, Jacksonian in type, which always involved the left side of the face, and the left arm and leg. Sight also became poor at that time, and her memory was not as good as formerly. In my examination she showed a paresis of the left arm and leg, these being spastic, and the reflexes were exaggerated. The Babinski sign was present on this side. There was also a paresis of the lower distribution of the left seventh nerve, and a paralysis of the left abducens and the left fifth nerve, both in its motor and sensory distribution. Optic neuritis was present in both eyes.

On protruding her tongue she had a clonic to and fro movement which became apparent on talking or moving the tongue. She became steadily worse and finally was comatose. The urine examination was

negative. She rallied, however, her symptoms steadily disappeared and she was discharged from the hospital four months afterward, the only remaining symptom being a dimness of vision.

These two cases are similar to those recorded by Nonne. No adequate explanation for them can be given.

LESIONS OF THE CEREBELLUM WITHOUT SYMPTOMS:—These lesions may be either congenital, acquired early in life, or may be tumors. It is not surprising that injuries to the cerebellum early in life or that tumors of slow development which occur in the same period give no appreciable symptoms, because the functions of the cerebellum in such cases have probably been assumed by other parts of the brain. Lesions of the lateral lobes of the cerebellum are less liable to cause symptoms than when they implicate the entire cerebellum. Spiller recorded three cases of lesion of the cerebellum in which there were no symptoms, and he also reviewed the literature upon this subject. In his first case one cerebellar lobe was smaller than the other, and it was sclerotic. In the second case there was a tumor upon the corpora quadrigemina in which the lateral lobe of the cerebellum was compressed. The third was one of tumor within the vermis.

Cases are recorded in which tubercles involved an entire lateral lobe and gliomata and cysts occupied the middle lobe, and yet there were no symptoms. Oppenheim refers to a case of Putnam's where the only symptom for years was an optic nerve atrophy, in which at necropsy a cyst of the cerebellum was found. He also refers to Bramwell's case, where in a thoroughly studied case no symptoms were apparent, while at necropsy four tumors were found.

It can readily be understood why symptoms may not be apparent in a gliomatous tumor, because of its infiltrating character, and in tubercles, in which the axis cylinders are retained; but it is difficult to explain the absence of symptoms in the other instances.

The notes of the case of cerebellopontile tumor, as shown in the illustration, Fig. 3, and Case II of this paper, were furnished by Dr. Mills. The patient was seen by Dr. Mills in consultation with Dr. W. W. Keen; she was also examined in consultation by Dr. W. G. Spiller. The tumor sprang from the eighth nerve, and the chief focal symptoms were one-sided deafness, tinnitus, facial monospasm, hypæsthesia of one side of the face, nystagmoid movements, slight paresis of right aducens, and vasomotor and cardiac disturbances. Severe headache, nausea, vomiting and optic neuritis were also present.

This patient was a married woman, 30 years of age, five of whose maternal relatives had died of cancer. Four years before coming under observation the ossicles of her left ear were removed, on account of an annoying tinnitus, but without the desired result. About one year later she began to suffer from severe headache. The next year slight optic neuritis was observed in both eyes, the neuritis going on to atrophy and blindness, which was complete in less than two years. Headache, nausea, vomiting and depression were recurring symptoms, and taste and smell were impaired. During two or three years she was treated for various complaints, as anæmia and neurasthenia, and both Graves's disease and interstitial nephritis were suspected. About six months before coming under observation she had a convulsion, with loss of consciousness, this being followed by several others of a similar kind.

The patient was having at somewhat frequent intervals attacks beginning with pain in the head, which was referred to the forehead and eyes. In these she became nauseated and then vomited, becoming pale or even cyanosed, with loss of consciousness. The vomiting was preceded or accompanied by marked facial monospasm, in which the mouth was drawn forcibly to the left and the eyelids were drawn together. Only the left side of the face was involved in the seizure. Examination showed that she had no ataxia of station or gait. Hearing on the right side was good, on the left side it was abolished. The mouth deviated slightly to the left when opened widely. Hypæsthesia to pain was present on the left side of the face and head, and sometimes appeared to be present in the left hand. The patient was not mentally impaired, but was easily exhausted mentally, and was at times irritable and depressed as the result of her sufferings. During the time she was under observation she had frequently recurring headaches, usually severe, sometimes accompanied with nausea or even vomiting, and sometimes with the facial spasm already described. Irregular nystagmoid movements occurred when the patient turned the eyeballs to the extreme right or left. She had complete loss of smell, and loss of taste on the left side of the tongue. On one occasion it was thought that the facial spasm was accompanied by some spasmodic movements of the left hand, but this was doubtful, and even the observer thought it may have been a voluntary movement.

The question of the existence of exophthalmic goitre was one which arose for diagnostic discussion several times during the history of this case. The diagnosis of this affection was first made a year or two be-

fore coming under our observation. It was also considered and favorably regarded by some of those who saw her in consultation late in the case. Her eyes had somewhat the staring expression of the blind; they were rather large, but her relatives stated that she had always had prominent eyes, and the exophthalmos was apparent rather than real. The enlargement of the thyroid was so doubtful as to cause some disagreement among those who examined her as to its existence. A slight enlargement of the gland on one side seemed sometimes to be present. Her pulse frequently, perhaps usually, was between 100 and 110, and sometimes rose above the latter point. It was a pulse such as is not infrequently seen in the late stages of an exhaustive intracranial disease. Graves's disease was finally excluded. In the light of the post-mortem findings, it is not improbable that some of the symptoms simulating this affection were due to the tumor, from its position, causing vasomotor and cardiac disturbances.

Ocular and opthalmoscopic examinations were made by Dr. W. C. Posey, who reported as follows: Ocular movements good in all directions, except externally to the right, where there is a slight limitation of movement, the right eye not being brought as far as normal into the external canthus. On fixation in the median line and below, the eyeballs are quiet. Marked lateral nystagmic movements appear, however, as soon as the eyes leave these primary positions, the nystagmus being most marked on extreme outward rotation to the right and to the left. The pupil in the right eye is round, and is 5 mm. in size; that in the left eye is oval, 3 by 4 mm., with its long axis at 50 degrees. The irides do not respond to light or accommodation stimuli. The opthalmoscopic examination reveals clear media in each eye, with the signs of regressive optic neuritis. The swelling of the nerves, however, is still very marked, both papillæ projecting into the fundi to the extent of 2 or 3 mm. The nerves are gray and succulent looking, and the retinal arteries and veins are tortuous and cord like. One nerve is not more swollen than the other. There are no extravasations or hæmorrhages, or traces of either of these, in the fundi. The patient is totally blind.

Other examinations were made by Dr. Posey, but they did not demonstrate anything different from what is above recorded.

Eventually an operation was performed in this case by Dr. W. W. Keen, by whom the patient was seen in consultation with Dr. Mills. Although a tumor at the base was considered, it was thought for several reasons that the lesion was probably in or beneath the facial centre. In the first place sufficient consideration was not given to the tinnitus

and deafness. Owing to the fact that a peripheral operation had been performed early for the relief of the latter, it was supposed that the impairment and disturbance of hearing were due to causes which were at least in part peripheral. The facial monospasm was much like that which is observed in the case of subcortical or cortical growth. It is interesting to note that some disease of the cortex was present at the position of the trephining, as demonstrated at the necropsy, but no tumor was found here. The patient died a few hours after the operation.

THE INCIDENCE OF GASTRIC AND DUODENAL ULCER FROM THE POST-MORTEM RECORDS OF THE PHILADELPHIA HOSPITAL.

By Albert Philip Francine, A. M., M. D.

The following figures from the analysis of the post-mortem records at Blockley (the Philadelphia Hospital) were undertaken at the request of Dr. Osler for Dr. C. P. Howard's paper on "The Incidence of Gastric Ulcer in America." They were not, however, completed in time to be incorporated in that paper, so that I present them now as an additional side-light on this interesting subject. I entirely agree with Dr. Howard's statement that we cannot base accurate or conservative conclusions on data obtained from clinical observations, and for that reason have confined myself to autopsy records alone. The discrepancies in clinical figures are well illustrated in his paper, where he deals with the subject from that standpoint. To quote him, "The figures from Philadelphia are rather puzzling. The University Hospital returns, kindly furnished me by Dr. James Tyson, give 19 cases out of 3979 admissions, or 0.48 per cent. On the other hand, the Pennsylvania Hospital has a very much smaller percentage, i. e., 0.13. This discrepancy cannot be accounted for by any apparent reason." (Unless one takes into consideration the acknowledged uncertainty of the diagnosis in many instances, and the wide opportunity this offers for clinical error.)

"In Baltimore we meet with similarly anomalous figures. At the Johns Hopkins Hospital there have been only 70 cases of gastric ulcer out of 16,553 medical admissions, for a period of about 15 years. This gives a percentage of 0.42, which is below New York (0.44), yet higher than Philadelphia (0.16). But in striking contrast are the figures from St. Joseph's Hospital, Baltimore, giving four cases out of 3298 medical admissions, or only 0.12 per cent. This then gives for Baltimore a percentage of 0.37, very far below New York, and still father below

Montreal (0.92) and Boston (1.28)." These figures are interesting and, no doubt, in a sense, indicative of the relative frequency of gastric ulcer in the localities specified, but surely lacking in the accuracy of the post-morten figures given subsequently in the same paper, as follows:

CLINICAL PERCENTAGES.				AUTOPSY PERCENTAGES.			
City.	Number Medical Admissions	Number Gastric Ulcers.	Per Cent.	City.	Number Autopsies.	Number Gastric Ulcers.	Per Cent.
Boston	33,506	432	1.28	San Francisco...	551	13	2.35
Montreal	20,466	189	0.92	Boston	3,089	57	1.84
New York.......	31,690	138	0.44	New York	561	8	1.42
Cleveland	3,427	13	0.38	Philadelphia	826	10	1.21
Baltimore	19,831	74	0.37	Montreal	3,158	33	1.04
Philadelphia	43,709	72	0.16	Cleveland	433	4	0.92
Chicago	3,930	6	0.15	Baltimore	2,223	19	0.85
Denver	5,040	6	0.12				
Total	161,599	930	0.57	Total	10,841	144	1.32

Breslau and Zurich...... 0.66 per cent.	London .... 4.6 per cent.
London .... 0.78 per cent.	Europe .... 8.54 per cent.
Berlin .... 1.33 per cent.	
Edinburgh .... 2.02 per cent.	

The great difference in the total number of autopsies in the several cities strikes me as also being a probable source of fallacy in calculating the absolute and relative frequency of ulcer in the different localities. In some instances, notably in the case of San Francisco, New York and Cleveland, they seem to me too small in the aggregate to base a fair average upon. All such figures are, however, distinctly valuable and bear out Dr. Howard's conclusions, i. e.: "1. Both clinically and pathologically ulcer is less frequent in America than in London and on the Continent. 2. That both clinically and pathologically, ulcer is more common in the northeastern than in the more southern regions of America, with the exception of San Francisco."

The clinical diagnosis of ulcer being so uncertain in many instances, I have not, as stated above, attempted to estimate the percentage of their occurrence from clinical diagnosis, but have confined myself to the autopsies alone.

Militating against this view, however, are the opinions of Mayo (C. H. Mayo, Medical News, April 16, 1904), who thinks that acute gastric

ulcer is by no means as rare as it is usually considered. He says that it must be recognized clinically, for it usually heals, and the treatment is purely medical. "It is altogether probable," he says, "that the vast majority of acute ulcers heal, but a considerable minority fail to do so and constitute a share of the chronic ulcers. A chronic ulcer is frequently if not usually chronic from its inception."

If it is true that the "vast majority" of acute ulcers heal, then the objections raised to the results of post-mortem study on this subject, by Byron Bramwell, have increased weight. [1] He thinks that acute ulcers often leave no scars and are not discovered at autopsy; or the scars, if present, are slight and often overlooked. So that a certain number of ulcers are overlooked in post-mortem statistics. Admitting the likelihood of these fallacies in acute ulceration, I still consider autopsy records the much surer way of computing the absolute and relative frequency of gastric and duodenal ulcers, certainly of the chronic forms.

The generally accepted causes for gastric ulcer are anemia, hyperchlorhydria, certain occupations like shoemaking and tailoring; mechanical injury, the grinding action of the pyloric end of the stomach (Mayo), chlorosis and menstrual disorders, embolism and thrombosis (Virchow), as in heart disease or continued vomiting; superficial burns, and lastly (and often rather casually mentioned), nephritis and tuberculosis. It will be seen from the statistics below that the great majority of these ulcers (which we must consider as the chronic forms) are associated with some chronic dyscrasic disease, as, for instance, nephritis and tuberculosis.

It will be seen in the accompanying cases that in almost, if not quite every instance, there was an associated condition (in 0.76 per cent. of the cases nephritis or tuberculosis), to which in some manner we must consider the ulcers, usually multiple, etiologically related, so that I feel these two factors, nephritis and tuberculosis, should be emphasized more emphatically in text-book descriptions of gastric ulcer than is usually done.

In this connection it would be interesting if we knew more about the relation of the stomach to chronic nephritis. Very little investigation has been done in regard to the perversions of gastric function in this relation, though such perversions are relatively frequent in nephritis. The investigations of Biernacki (Centralbl. f. klin. Med. 1890; Berlin klin. Wochenschr, 1891) seem to show that the secretion of gastric juice is in general reduced in all cases of inflammation of the kidney. Occasionally hydrochloric acid was absent, especially in severe

cases of nephritis, during the stage of edema, while it was present in milder cases, in large or small quantities. The secretion of pepsin was reduced, even in mild cases; while the motor power of the stomach was frequently found increased, not only in mild cases, but also in old chronic cases. He thinks that the glandular function is inhibited by toxic metatolic products, and that organic changes take place in the stomach, in those cases in which nephritis has persisted for a long time and in which the blood-changes are considerable and the nutrition of all the tissues has suffered. It may well be that one of the results of this perversion of function is the chronic gastric ulcer.

Since the time of Cruveilhier[1] (1835), who first recognized this condition, there have been numerous and classical reports upon gastric and duodenal ulcer, both in France and Germany. Rokitansky[2] (1839) and Jaksch[3] (1843) published careful studies in relation to gastric ulcer, while Krauss[4] (1865), Chvostek[5] (1882) and Oppenheimer[6] (1891) have done the same in relation to duodenal ulcer. Indeed, following Cruveilheir's description, there have been in Europe, particularly Germany, an almost continuous series of experimental studies and reports contributing to our knowledge of these interesting morbid conditions. The foreign literature upon the subject is now enormous.

This has not, however, been the case in America, and accurate figures gleaned from autopsy records while slowly making their appearance, as in Dr. Howard's valuable paper, are still all too scanty. So that any data, however inconsiderable, should, I feel, be welcome to those interested in scientific medicine.

List of Patients admitted to Medical Department of the Philadelphia Hospital (Blockley) from January 1, 1893, to December 31, 1902 (inclusive).
Men's Medical Ward—1893—1524.
    "   "   " —1894—1506.
    "   "   " —1895—1568.
    "   "   " —1896—1475.
    "   "   " —1897—1254—7327.
Vols. 16, 17, 18, 19,
  . 115½, 116.
    "   "   " —1898—1358.
    "   "   " —1899—1399.
    "   "   " —1900—1545.
    "   "   " —1901—2013.
    "   "   " —1902—1809—8124.

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1 Anatomie Pathologique 1829-1835, Vol. I; Revue Medicale 1838; arch, gen. de med. 1855.
2 Oestreich. Jahrb. 1839.
3 Prague Vierteljahrsschr. 1843.
4 Das perforirende Geschwur in Deutsch. Berlin. 1865.
5 Wein. Med. Jahrb. 1883.
6 Mang. Diss. Wurzburg. 1891.

Vols. 116, 126, 127, 128, 133.
   152, 153.
                        15,451—End of 10 years.
Men's Alcoholic—1893— 517.
    "   "   —1894— 460.
    "   "   —1895— 396.
    "   "   —1896— 497.
    "   "   —1897— 515—2385.
Vols. 124, 125.
    "   "   —1898— 720.
    "   "   —1899— 710.
    "   "   —1900—1002.
    "   "   —1901— 978.
    "   "   —1902— 989—4399.
Vols. 124, 125, 157.
                        6784—End of 10 years.
Men's Detention—1893—369.
    "   "   —1894—338.
    "   "   —1895—395.
    "   "   —1896—363.
    "   "   —1897—368—1833.
Vol. 120.
    "   "   —1898—386.
    "   "   —1899—424.
    "   "   —1900—508.
    "   "   —1901—574.
    "   "   —1902—502—2394.
Vol. 154.
                        4227—End of 10 years.
Men's, Colored—1893—162.
    "   "   —1894—149.
    "   "   —1895—193.
    "   "   —1896—201.
    "   "   —1897—183—888
Vol. 123.
    "   "   —1898—192.
    "   "   —1899—183.
    "   "   —1900—182.
    "   "   —1901—279.
    "   "   —1902—289—1125.
Vol. 155.
                        2013—End of 10 years.
Women's Medical—1893—468.
    "   "   —1894—562.
    "   "   —1895—588.
    "   "   —1896—536.
    "   "   —1897—475—2629.
Vols. 66, 66½, 106, 113.
    "   "   —1898—562.
    "   "   —1899—621.
    "   "   —1900—699.
    "   "   —1901—734.
    "   "   —1902—680—3296.
Vols. 113, 136, 139.
                        5925—End of 10 years.

Women's Detention and Drunk—1893—313.
  "   "   "   " —1894—331.
  "   "   "   " —1895—350.
  "   "   "   " —1896—343.
  "   "   "   " —1897—349—1686.
Vols. 82—111.
  "   "   "   " —1899—436.
  "   "   "   " —1900—558.
  "   "   "   " —1901—555.
  "   "   "   " —1898—424.
  "   "   "   " —1902—606—2577.
Vol. 139.
         4263—End of 10 years.
Women's, Colored—1893— 56.
  "   " —1894— 62.
  "   " —1895— 76.
  "   " —1896— 83.
  "   " —1897— 70—347.
  "   " —1898— 96.
  "   " —1899— 92.
  "   " —1900—101.
  "   " —1901—116.
  "   " —1902—127—532.
      879—End of 10 years.
Making a grand total of 39,542 cases in 10 years.

Cases of gastric duodenal ulcer coming to autopsy during this time:

1. (Vol. vi. P. 241): Ulcer in duodenal half a centimetre in diameter with thick white edges; 8 cm. from pylorus; tubercular ulceration of intestine. Male. White. Agter thirty-five years.

2. (Vol. vi. P. 244): Small ulcer in stomach over pylorus, with a deposit of pigment; ½ cm. in diameter; interstitial nephritis and fatty heart. Male. White. Aged 32 years.

3. (Vol. vi. P. 262): Along lesser curvature there are several small superficial ulcers in stomach; tubercular ulcers in oesophagus and intestines; tuberculosis of both lungs. Male. Black. Aged twenty-three years.

Vol. vi from January 1, 1893, contains fifty-three autopsies.

4. (Vol. vii. P. 29): Stomach shows scars of old ulcers; intestinal nephritis. Female. White. Aged fifty-five years.

5. (Vol. vii. P. 53): Stomach shows a few very small ulcers; tuberculosis of lungs and intestines. Male. Black. Aged eleven years.

6. (Vol vii. P. 108): Stomach shows not less than a dozen bodies in the mucous membrane resembling tubercles, which have undergone ulceration; miliary tuberculosis. Male. White. Aged thirty-two years.

7. Vol. viii. P. 183): Duodenum shows minute swelling and ulceration of solitary glands and at some points, hemorrhage; miliary tuberculosis of right lung; parenchymatous nephritis. Male. White. Aged fifty-three years.

8. (Vol. vii. P. 203) : Cup-shaped ulcer of pyloric end of stomach; chronic parenchymatous nephritis. Female. Black. Aged forty-two years.

9. (Vol. vii. P. 269) : At the pylorus and within the valve there is an ulcer on the lesser curvature and anterior surface about one and one-half inches in diameter; carcinoma of stomach, liver, lymph glands. Female. White. Aged 37 years.

10. (Vol. vii. P. 270) : Numerous small ulcers in the stomach, toward the pyloric end and also in the duorenum; hypertrophy and dilatation of heart. Male. White. Aged sixty-four years.

Vol. vii. contins 286 autopsies.

11. (Vol. viii. P. 60) : About 5 cm. from pylorus and on greater curvature there are some small ulcers about 2 cm. in diameter; miliary tuberculosis. Male. Black. Aged twenty-three years.

12. (Vol. viii. P. 93) : There is an old cicatrix on lesser curvature, midway between aesophageal and cardiac orifices; interstitial nephritis; atheroma. Female. White. Aged fifty-six years.

13. (Vol. viii. P. 101) : There is a small ulcer in stomach; interstitial nephritis. Female. White. Aged forty-four years.

14. (Vol. viii. P. 274) : A healed ulcer in posterior wall of stomach, 10 cm. from lesser curvature and 5 cm. above pylorus; seirrhuscarcinoma of plyorus. Female. White. Aged fifty years.

Vol. viii. contains 297 autopsies.

15. (Vol. ix. P. 8) : Stomach contains three small ulcers, round and clear cut; one 9 mm. in diameter on anterior surface, near pylorus, perforating; a similar one at other extremity on median and posterior aspect; and a third on the interior surface 4 cm. from last one, 11 mm. in diameter; chronic bronchitis; chronic gastritis. Male. White. Aged fifty-eight years.

16. (Vol. ix. P. 123) : Upon posterior surface of stomach, just above pyloric opening, there is a large perforating ulcer with raised indurated edges; carcinoma of stomach. Male. White. Aged fifty-four years.

17. (Vol. ix. P. 259) : There are multiple round ulcers in stomach and duodenum; perforating ulcer of duodenum; atelectasis of left lung. Male. White. Aged twenty-seven years.

18. (Vol. ix. P. 278). There is a large ulcer in stomach a little behind and below pyloric orifice; interstitial nephritis. Male. Black. Aged fifty-five years.

Vol. ix. contains 297 autopsies.

19.   (Vol. x. P. 16) : There are ulcers in stomach varying in size from pinheads to a pea; miliary tuberculosis. Male. White. Aged sixty-three years.

20.   (Vol. x. P. 92) : Duodenum is ulcerated; interstitial nephritis. Female. White. Aged sixty-seven years.

21.   (Vol. x. P. 147) : On greater curvature there is a circular ulcer 1 cm. by ¾ cm.; it is in posterior wall nearer the cardiac than to pyloric end and is crater-like with indurated edges; tuberculosis of lungs; chronic nephritis. Female. White. Aged twenty-seven years.

22.   (Vol. x. P. 219) : There is a small round ulcer with well defined margins in greater curvature of stomach; parenchymatous nephritis; myoand endo-carditis. Female. Black. Aged twenty-one years.

Vol. x. contains 311 autopsies.

23.   (Vol. xi. P. 144) : On lesser curvature, on anterior aspect of stomach, there is a round ulcer 1 cm. in diameter, which has nearly perforated; parenchymatous nephritis; gangrene of lung. Male. White. Aged twenty-five years.

24.   (Vol xi. P. 286) : There is a small round superficial ulcer in stomach; gangrenous stonatitis; diphtheritic gastro-enteritis. Female. White. Aged ten months.

25.   (Vol. xi. P. 295) : There is a small ulcer in the duodenum; entero-colitis. Female. White. Aged three years.

Vol. xi. contains 310 autopsies.

26.   (Vol. xii. P. 55) : Near the cardiac end in relation to the lesser curvature there is an ulcer which measures ½ cm. in diameter, is cup-shaped, with slightly indurated edges; labor pneumonia. Female. Black. Aged twenty months.

27.   (Vol. xii. P. 154) : On anterior surface near pylorus is an ulcer 2x3 mm. with irregular undermined base; miliary tuberculosis; extensive superficial burns; eight-ten weeks old; chronic parenchymatous nephritis. Female. White. Aged thirty-eight years.

28.   (Vol. xii. P. 176) : In neighborhood of fundus and extending toward greater curvature there are large ulcerations; the largest of these is probably 9-10 cm. long and 8-10 cm. wide; the ulcer tends to surround the cardiac end; the edges are ulcerated and thickened; tuberculosis lungs. Male. White. Aged forty-eight years.

29.   (Vol. xii. P. 262) : About 10 cm. from pyloric orifice in greater curvature there is a small clear-cut ulcer about 12 mm. in diameter, base clean, edges sharp cut; tuberculosis of lungs; acute nephritis. Male. Black. Aged forty-seven years.

Vol. xii. contains 300 autopsies.

30.   (Vol. xiii. P. 10) : On posterior wall about six inches from pylorus is a peptic ulcer about size of a quarter of a dollar; chronic interstitial nephritis. Female. White. Aged seventy-six years.

31.   (Vol. xiii. P. 19) : Stomach contains a few peptic ulcers of small size; chronic interstitial nephritis. Male. White. Aged sixty-eight years.

32.   (Vol. xiii. P. 151) : Greater curvature shows a series of fine linear ulcerations arranged around eosophageal opening; these ulcers are about 4-6 mm. in width; similar small ulcers are found in other parts of stomach; great anemia; chronic nephritis. Female. Black. Aged sixty-eight years.

33.   (Vol. xiii. P. 169) : Six and one-half cm. from pylorus in anterior wall, a large irregular oval ulcer is found, 5 cm. in length, opening in the long axis of the stomach; two more ulcerations similar in character, but smaller, are noted. Fatty degeneration of liver and kidneys. Male. White. Aged twenty-six years.

34.   (Vol. xiii. P. 220) : Five cm. from pylorus is a loss of substance ½ cm. in diameter; base of ulcer is smooth; edges ulcerated and sharply cut; arterio-sclerosis; chronic nephritis. Female. White. Aged sixty years.

35.   (Vol. xiii. P. 170) : Within 5 cm. of pylorus are four small ulcers, varying from ½ cm. in diameter, with elevated edges; chronic nephritis; fatty degneration of liver. Female. Black. Aged fifty years.

30.   (Vol. xiii. P. 185) : Pylorus is occupied by pigmented tuberculous ulceration, oval in form 4-5 cm. by 2 cm. in extent; base granular; tuberculosis. Female. White. Aged seventy-four years.

37.   (Vol. xiii. P. 267) : Along lesser curvature within 5 cm. of pylorus is found an area of ulceration 4 cm. in diameter, borders elevated and indurated; base of ulcer is bile-stained; chronic nephritis. Male. White. Aged seventy-four years.

Vol. xiii. contains 302 autopsies.

38.   (Vol. xiv. P. 1) : Stomach contains a large tuberculosis ulcer as big as a quarter of a dollar, not far from pylorus; miliary tuberculosis. Male. Black. Aged thirty-six years.

39.   (Vol. xiv. P. 71) : Stomach is the seat of chronic catarrhal inflammation with ulceration and thickening of its walls; tuberculosis; chronic nephritis. Female. White. Aged sixty-one years.

40.   (Vol. xiv. P. 234) : There are several small ulcers in stomach; the largest is about 1 cm. in diameter; interstitial nephritis. Male. White. Aged fifty-five years.

Vol. xiv. contains 300 autopsies.

41. (Vol. xv. P. 129): There are superficial depressions in the mucous membrane of stomach which may be healed ulcers; carcinoma of uterus. Male. White. Aged fifty-seven years.

42. (Vol. xv. P. 213): About midway between cardia and pylorus are two or three small ulcers; the largest is about 8 mm. in diameter; they are shallow with irregular raised margins; miliary tuberculosis. Female. White. Aged thirty-one years.

Vol. xv. contains 297 autopsies.

Vol. xvi. up to January 1, 1903, contains 77 autopsies. No case of ulcer of either stomach or duodenum to date.

Total number of autopsies in 10 years, 2830.

CONCLUSIONS.—The following grouping shows the ulcers in relation to their apparent cause. Those in association with

CHRONIC NEPHRITIS: (2) 6.244; (4) 7.29; (8) 7.203; (12) 8.93; (13) 8.101; (18) 9.278; (20) 10.92; (22) 10.219; (23) 11.144; (30) 13.10; (31) 13.19; (32) 13.151; (33) 13.169; (34) 13.220; (35) 13.170; (37) 13.267; (40) 14.234. Total, 17; 16 gastric; 1 (20) 10.92 duodenal.

TUBERCULOSIS, Miliary or of Lungs: (1) 6.241; (3) 6.262; (5) 7.53; (6) 7.108; (7) 7.183; (11) 8.60; (19) 10.16; (28) 12.176; (29) 12.262; (36) 13.185; (38) 14.1; (42) 15.213. Total, 12; 11 gastric; 1 (7.183) duodenal.

BOTH TUBERCULOSIS AND NEPHRITIS: (21) 10.147; (27) 12.154; (39) 14.71. Total, 3 gastric.

CHRONIC BRONCHITIS: (15) 9.8; gastric.

PNEUMONIA (26) 12.55; gastric.

ATELECTASIS OF LUNGS: (17) 9.259; both gastric and duodenal.

CARCINOMA, of Stomach or Elsewhere: (9) 7.269; (14) 8.274; (16) 9.123; (41) 15.129. Total, 4; all gastric.

HEART, Fatty: (10) 7.270; both gastric and duodenal.

ENTERO-COLITIS IN INFANTS: (24) 10.286; (25) 10.295; both gastric.

(Extensive superficial burns, with tuberculosis and nephritis: (27) 12.154. Classified above under tuberculosis and nephritis.)

Grand total, 42; total gastric, 38; total duodenal, 2; both gastric and duodenal, 2.

In 20 out of 42 cases, or 0.47 per cent., the ulcers were multiple. Mayo says that in 20 per cent. of cases more than one ulcer is present. Brinton (Ulcer of Stomach, 1837) in 463 autopsies upon cases with

ulcer of the stomach, found 57 with two ulcers, 16 with three or four, 2 with five and 4 with more than five.

The sexes in the above series were equally divided, there being 21 males and 21 females, and the average age for the males was forty-three years, and for the females the same, a remarkably equal distribution. Welsh, in his statistics, found 40 per cent. in males and 60 per cent. in females. The largest number of cases in his series occurred in males between thirty and forty, and in females between twenty and thirty, but there was much uniformity in the distribution in relation to the four decades. In my series, the greatest number of cases occurred in males, five, between fifty and sixty years, and in females, five, between forty and fifty years. Here, too, there was a tolerable uniformity in relation to the four decades. Three of the cases were in infants, ten, twenty and thirty-six months old, respectively. Dr. Osler mentions a case reported by Goodhart in an infant thirty hours old.

It should be borne in mind in relation to these figures that the age given is the age of death, and not the age of the incidence of the ulcer, which must be considered as occurring earlier.

In regard to size, Dr. Osler mentions an ulcer 19x10 cm., reported by Peabody as the largest one he knows of. The largest one in my series (No. 28) was 9-10 cm.x8-10 cm. The same authority refers to a case reported by Berthold in which there were 34 small ulcers. Similar cases of multiple ulcers are seen in my cases, Nos. 10 and 32, above.

It should be remembered in basing conclusions on the above figures that the lame, the halt and the blind of the city's streets sooner or later find their way to the Philadelphia Hospital and Almshouse, and that it is pre-eminently the house of chronic invalidism and disease.

Dr. Joseph Walsh, pathologist to the Henry Phipps Institute (1903) tells me that during his service there were 52 autopsies on those dead of tuberculosis, and that in one case he found numerous small superficial ulcers in the stomach. Dr. Rosenberger, who followed him, says that during the year 1904 there were 55 autopsies and no instance of gastric nor duodenal ulceration.

To briefly recapitulate, the total number of medical admissions to the Philadelphia Hospital for ten years, from January 1, 1893, to December 31, 1902, inclusive, was 39,542. The total nnmber of autopsies was 2830. The total number of ulcers was 42, of which two were purely duodenal. Summary:

Hospital.	No. of Autopsies.	No. of Gastric Ulcers.	Per centage.
Phila. Hospital and Almshouse......	2830	40	1.41
Pennsylvania Hospital	547	7	1.28
University Hospital	279	3	1.07
Henry Phipps Institute............	107	1	.94
City of Philadelphia............	3763	51	1.35

INNOMINATE ANEURYSM IN THE PHILADELPHIA HOSPITAL.

By Albert P. Francine, A. M., M. D.

The following nine cases of aneurysm of the innominate artery were collected from an analysis of the post-mortem records of the Philadelphia Hospital, covering in all 5750 autopsies, from 1875 to 1903, volumes I to XVI, inclusive. References to the first three cases were in the first instance kindly furnished me by Dr. William Pepper. From a careful study of the records I believe this to be a complete list, comprising all the innominate aneurysms which have occurred in the Hospital to date.

This series* formed the basis of a clinical paper dealing with the symptoms and physical signs of innominate aneuryism, which I read before the Section on Medicine of the American Medical Association in June, 1904, which was subsequently published in the Journal of the Association, November 5, 1904. For a complete consideration of the subject from an analysis of a series of 146 cases collected from the literature, the reader is referred to that article.

It is unfortunate that in studying the Blockley cases the clinical notes are so inadequate. In four instances out of the nine the presence of aneurysm was suspected; but in no instance was the diagnosis of innominate aneurysm made. Those portions of the autopsy record in each case which concerned the aneurysm, or the condition of the heart and vessels, have been given in full. The clinical histories, when obtainable, have been given in full, being even then in most of the cases too sketchy and incomplete to furnish much of a clinical picture. The course of the case from day to day is not noted, and the curt entry "died" gives no clew as to the manner of death. In some instances, as attested by the autopsy notes, it was by rupture of the aneurysm.

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*For two additional cases reported by the author see the Proceedings of The Philadelphia Pathological Society for June, 1904.

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CASE 1. Peter S——. August 5, 1877, page 185. Vol. of autopsies, labeled 1875-1878. Clinical diagnosis not given, clinical history not obtainable. Age 32. The innominate artery is dilated so that its orifice could probably hold an egg. The walls of the aorta are also dilated, helping the innominate to form a small sacculated aneurysm. This small sac contains a thin layer of laminated clot. The tumor pressed upon the trachea to the extent of producing softening at the tracheal rings. The aneurysm had not ruptured. The heart was moderately hypertrophied, dilated and flabby. The aorta was atheromatous.

CASE 2. John W——. Volume 1, page 64. Clinical diagnosis not given, clinical history not obtainable. Age 44. Male. Black. The innominate artery just at its departure from aorta is the seat of an aneurysm of the size of an egg. The aneurysm is filled with recent chicken fat thrombi. The rest of the thoracic and abdominal aorta is normal and shows no atheroma. The heart valves and orifices are normal. The aneurysm had not ruptured.

CASE 3. John D——. Volume 1, page 306. Clinical diagnosis, organic asthma. Clinical history not obtainable. Age 66. Male. A large aneurysm of the innominate artery had displaced the trachea to the left side, compressed and lessened its calibre and had caused partial absorption of the tracheal rings. It was filled with a very firm fibrous clot, which extended into the right sub-claviar. The right carotid across from the aneurysm, which was about five inches long, fusiform in shape and about three inches in its greatest diameter. There was a sacculated aneurysm of the ascending arch of the aorta.

CASE 4. John G——. Post-morten record, 81. Volume 6. Clinical diagnosis, aneurysm. Colored male, aged 32 years, unmarried, laborer. Clinical history not obtainable. Mode of death, rupture of the aneurysm into the pericardium. One-half inch below the innominate there is a calcareous patch, situated at the bottom of an aneurysmal dilation, the innominate coming off from the uppermost border of the aneurysm, which is of the size of a pigeon's egg. In the ascending portion of the aorta, a quarter to one inch above the free margin of the aortic valves, is a dissecting aneurysm the size of a goose's egg—dissecting toward the left side posteriorly and beneath the pulmonary artery. The aneurysm has ruptured just below the attachment of the pericardium, on its upper surface, between the right side and the right side of the pulmonary artery. The size of the orifice admits an ordinary small probe; and a small, irregular flap projects inward into the pericardium. There are several other smaller dissecting aneurysms which would

probably have ruptured sooner or later. There are evidences of syphilis in other organs.

CASE 5. William T——. Post-morten record, 285. Volume 9. Colored male aged 51 years. Pathologic diagnosis, innominate aneurysm. Right side of heart enormously distended with ante-mortem clots. Left auricle and ventricle contain post-mortem clots. Tricuspid valve transmits five fingers and thumb. There is a saccular aneurysm of the aorta from the sinus of Valsalva to the beginning of the descending aorta, involving the innominate and the sub-clavian, which come off from the aorta as funnel-shaped dilations. The wall of the aneurysm shows universal atheroma with fatty and calcareous plates. Clinical notes : Colored male, aged 51 years. Diagnosis, valvular heart disease. Large, well-nourished colored man, with eyelids somewhat swollen; legs exceedingly edematous; pulse weak, but regular. Area of cardiac dullness enlarged, impulse diffuse and heaving, with a systolic thrill. At apex two murmurs, presystolic and systolic; and at the base, two murmurs, the systolic transmitted into the vessels of the neck, and the distolic conducted down the sternum. The breathing is Cheyne-Stokes in type. The heart-sounds are everywhere distant and muffled; and the precordial dullness is wide, making it probable that there is pericardial effusion. Two days later : The pulsation of the heart is felt distinctly, and seen also, below the costal border, at the left of the middle line; probably right ventricular pulsation. The heart-dullness extends as above. The patient suffers greatly with dyspnea, orthopnea, and Cheyne-Stokes breathing. The feet are very edematous.

CASE 6. William S——. Post-mortem record, 229. Volume 11. Colored male, aged 43 years. Died from rupture of the aneurysm. The innominate is but a band of tissue 0.25 cm. in thickness. The opening into the innominate is 1.75 cm. in diameter. It communicates with a cavity, lobular, in form, 7.5 cm. in diameter, and obscured by a laminated clot. There are several external layers anteriorly which are evidently older. Within the external layer is a clot, irregularly globular, 4.5 cm. in diameter, within which is coiled the gold wire. The carotid and sub-clavian on the right are normal. A saccular aneurysm arises from the anterior wall of the innominate artery; it projects forward and toward the median line, in front of the trachea, which is slightly flattened, but shows no erosion in its interior. The wall of the aneurysm is partly made up of the dilated artery. The arterial wall is a comparatively narrow strip, not exceeding 1.5 cm. from aortic opening. Beyond this

it is impossible to say whether the aneurysm is formed from the vascular wall or from inflammatory densely massed periarterial connective tissue. The weight of the mass—heart, larynx, trachea and aneurysm —is 720 grams. The cardiac cavities are empty, and the walls flabby. There are extensive adhesions inflammatory in origin. The larynx and all the great trunks of the neck are matted together. To demonstrate the relations it is necessary to secure the heart, the arch of the aorta, and the adjacent structures in one mass. The valves and orifices of the heart seem normal except for some old fenestra. The muscle is pale, soft and pliable; there is abundant superficial fat. The coronary arteries show a moderate degree of atheroma, but this does not obstruct their lumen. The arch of the aorta is slightly dilated and shows a few artheromatous patches. The right sub-clavian and the common carotid are normal.

CASE 7. John C——. Post-mortem record, 299. Volume 13. Pathologic diagnosis, innominate aneurysm. White male, aged 43 years. The aorta thickened and roughened, showing patches of calcareous infiltration. Four centimetres above the aortic cusps the circumference is 18 cm. The ascending and transverse portions are widely dilated, as is also the orifice of the innominate. Just beneath its point of bifurcation there is a saccular dilatation extending inward in front of the trachea and reaching upward to the base of the cricoid cartilage. It contains a mass of laminated clot. The heart-length from base to apex is 20 cm.; from right border to apex, 17 cm. The apex is in the seventh interspace, 3 cm. beyond the midclavicular line. The right auricle is distended with clot; the left is somewhat dilated. The left ventricular wall is 1.5 cm.; the right, 1 cm. The muscle is pale and friable, and there is nodular thickening of the mitral leaflets. The mitral valves are incompetent to the water-test, as are also the aortic valves. There is slight thickening, with retraction of the aortic cusps. Behind the left anterior cusp is a saccular dilatation about 3.5 cm. in diameter. The upper and exterior portion is very soft and pliable, and contains adherent clot and fibrin. The dilatation seems to proceed into the wall of the heart. The pulmonary and tricuspid valves are normal. Clinical notes: Diagnosis, valvular heart disease. White male, aged 43 years. Chief complaint, cough, expectoration, dyspnea, epigastric tenderness and distention of the abdomen.

CASE 8. Patten H——. Post-mortem record, 239. Volume 15. Pathological diagnosis, innominate aneurysm. Colored male, aged 38 years. The aorta is the seat of marked sclerosis, an aneurysm the size

of a large orange springs from the origin of the innominate and the arch of the aorta, on opening (?) is 15 mm. in diameter. The innominate is still pervious. The aneurysm begins in the upper portion of the arch, extending within 3¾ mm. of the common carotid. The left sub-clavian is obliterated by a firm clot. The origin of this vessel cannot be found, but there is a depressed scar. The aneurysm is adherent anteriorly and laterally to the clavicle, sternum, and left ribs, and is partly covered by pericardium. It is filled with laminated clot. Clinical notes: Diagnosis, aneurysm. Colored male, aged 38 years. Chief complaints, cough, expectoration, asthma, strong pulsation of blood vessels and pulsation in the supraclavicular fossa on the right side. Had syphilis at 15 years. Present trouble began one year ago, when he says he received a blow over the clavicle. Later, he noticed pulsation of the carotid artery. Three months later he began to have "asthma;" he has had four spells in this time. Has had cough, accompanied with pain, for two months. Examination of chest: On right the clavicle shows an old fracture (sternal end), and expansile pulsation of carotid artery can be seen. No thrill. The swelling is about the size of a pigeon's egg. On the right side of the chest, from the apex to the fourth rib and in the axilla there is a marked friction-rub. The right temporal artery is not visible, the left prominent. The right facial and temporal are not palpable. The left facial and temporal are vigorous. The right external jugular is distended. There is a small tender nodule two inches above the clavicle. When this is pressed, pain is felt in the back of the neck and head. Both radial and brachial pulses are imperceptible. The sternal end of the right clavicle is prominent, and shows a distinct heaving pulsation, which can be felt at each side of the sternocleidomastoid muscle. There is no thrill, but a distinct double shock, the diastolic being the more powerful. There is no pulsation in either sub-clavian artery. The aortic second is louder than the pulmonic second. Over the aneurysm there are two dull booming notes, the first prolonged and the second accentuated; over the left carotid there is a loud booming diastolic note. There is slight impairment of the percussion over both apices. There is dullness under the sternal end of the right clavicle. The veins in the right side of the neck are more prominent than on the left. We notice a globular mass whose superficies is under the right sternoclavicular articulation, and which pulsates synchronously with the vessels of the neck. It exerts no traction on the trachea, and is dull on percussion half-way down the manubrium. The growth has a heaving pulsation and is very resistant.

CASE 9. Rosie D——. Post-morten record, 176. Volume 16. Pathologic diagnosis, innominate aneurysm. The patient was a colored female, aged 46 years. The innominate artery, about an inch beyond the orifice, was the seat of an aneurysmal dilatation the size of an orange, containing laminated clot, and adherent to the clavicle, the first rib, and the upper part of the sternum. From it came off a diminutive sub-clavian; aorta showed atheroma. Clinical notes: Diagnosis, aneurysm of the sub-clavian artery. Colored female, aged 46 years. Patient is a well-developed and well-nourished woman. She shows marked dyspnea. The eyes are bulging and the face has a restless, frightened expression. She states that about three months ago she discovered a "lump" in her neck, and had an attack of asthma. Since that time the attacks have been growing more frequent and more severe. They are so bad now that she begs to have an operation performed on her neck. In the neck there is a moderate-sized tumor, extending more to the right side, not moving when the patient swallows, and having an expansile pulsation with a thrill, but over which no bruit is heard. The tumor is not tender to palpation. There is no tracheal tugging. The tumor is fixed below. There is no heart-lesion demonstrable, but the heart's action is very forcible. The limbs are slightly edematous; the lungs and abdomen, negative.

THE USE OF METHYLENE BLUE IN MALARIAL FEVERS.

By Horatio C. Wood, Jr., M. D.

Although the introduction of quinine into medicine has revolutionized the prognosis of malarial diseases, it can scarcely be considered an ideal remedy. Among its disadvantages may be mentioned its irritant action upon the kidneys, which in some cases has entirely prohibited its use, the unpleasant by-symptoms, especially tinnitus aurium, and the not infrequent idiosyncrasies in patients in whom there may occur a variety of toxic manifestations. On account of these and other occasional objections to this drug, and in view of the fact that in certain forms of intermittent fever, quinine seems almost without effect upon the course of the disease, a large number of remedies have, from time to time, been employed in the treatment of malarial conditions, some of which have shown themselves to be possessed of more or less feeble antiperiodic power. Nearly all of these remedies on further experience, however, have proven so vastly inferior to quinine that, with the exception of arsenic in certain types of malaria, cinchona remains for the majority of practitioners the sole weapon against the miasm. In 1891 Ehrlich and Guttmann, led by the discovery of Celli and Guarnieri of the peculiar relations of the plasmodium to methylene blue as a staining agent, essayed its therapeutic use in two cases of malaria. The results in these two cases proving favorable, a number of other investigators have made similar trials, until we are able to present the statistics of over 400 cases in which the drug has been used. Nevertheless, in this country at least, methylene blue has not received general recognition as an antiperiodic, and it has seemed, therefore, worth while to report the results which were obtained in a small series of cases at the Philadelphia Hospital during the past summer, and to compare them with those that have been already published. The cases which I shall report occurred in the services of Drs. David Riesman and T. Mellor Tyson, to both of whom I desire to express my thanks for the p~   ~iblish them.

CASE I. Admitted September 1, 1904.

CHIEF COMPLAINT. Chill, followed by fever—pain throughout body.

PAST MEDICAL HISTORY. Had usual diseases of childhood; malaria one and a half years ago, treated in this hospital.

HISTORY OF PRESENT ILLNESS. Was first taken ill two weeks ago with a chill each evening about 7 o'clock, followed by temperature and sweating. Has had herpes labialis. Complains of pain throughout body, dyspnea on exertion, and apathy and somnolence.

PHYSICAL EXAMINATION. Liver: Fifth rib to one inch below costal margin. Spleen much enlarged; lower border extends two inches below costal margin, anterior boundary is the mid-clavicular line, in the abdomen the umbilicus, upper border seventh rib.

TREATMENT. Methylene blue, gr. ii every three hours.

September 2. Chill, fever, and sweat at 9.45 last night. Plasmodium found in the blood.

September 3. No chill last night. Patient complains of pain in left shoulder and looks quite ill and depressed. Blue spots on hand from handling methylene blue.

September 4. Patient had a slight elevation of temperature without chill yesterday afternoon, and complains of being feverish last night, but no chill.

September 13. Patient has had no further chill or fever since last note. He has constantly complained of pain in the left side and shoulder—careful examination shows no pleurisy. The spleen is much reduced in size, but very painful to palpation; possibly the engorged spleen explains the pain in the left side. Ordered quinine, gr. iii every three hours. Stop methylene blue.

September 26. The spleen has lost its tenderness and patient feels quite well, and requires no further hospital treatment.

September 27. Discharged, cured.

CASE II*. Admitted August 24, 1904.

CHIEF COMPLAINT. Cough with some expectoration, pain in lumbar region and left side chest, and general weakness.

PAST MEDICAL HISTORY. Negative.

HISTORY OF PRESENT ILLNESS. Two weeks ago was taken with feeling of general weakness which he ascribed to heat. States that he has had pains throughout the body.

PHYSICAL EXAMINATION. Tongue: moist, yellowish fur, pale. Lungs: vocal fremitus slightly increased over right side anteriorly, impaired resonance right apex from clavicle to just below second rib, breath sounds clear, a few moist rales on coughing, increase of vocal resonance over above area. Heart: apex beat visible and palpable in the fifth interspace, cardiac boundaries; third rib right of sternum, midclavicular line on the left. First sound at the apex moderately loud—accompanied by a soft blowing, systolic murmur, with slight transmission. Liver: dullness, fifth rib to costal border. Spleen: negative.

August 26. Chill last night with fever and sweating. Plasmodium found in blood.

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*This patient received one dose of quinine (gr. v) before beginning with methylene blue.

TREATMENT. Methylene blue, gr. ii every third hour.

August 27. Patient has labial herpes.

September 1. No chill nor fever since the 26th. Patient feels well and wished his discharge. Discharged September 9, 1904.

CASE III. Admitted September 19, 1904.

CHIEF COMPLAINT. Headache and pain in small of back; some diaphragmatic pain on deep inspiration.

PAST MEDICAL HISTORY. Diseases common to childhood.

HISTORY OF PRESENT ILLNESS. On September 14, after some headache with feeling of lassitude, he had a chill, followed by fever. Patient states that almost every evening since the above date feels badly—has temperature and is nervous.

PHYSICAL EXAMINATION. Tongue, large, broad, flabby, heavy, whitish fur, fissured, unsteady, not very red at tip or edges. Abdomen slightly distended and increased in tension, some gurgling on deep palpation over cecum, no tenderness. There is one spot on left side of abdomen which resembles somewhat a typhoid spot. Lungs: no abnormalities. Liver: upper border to sixth rib to costal margin. Spleen: seventh interspace, anterior axillary line—one-half inch above costal margin—on deep inspiration there is repaired resonance below costal margin (Riesman's sign).

September 22. Early this morning had epistaxis for about 20 minutes; did not lose much blood. Complains of pain in lower part of chest. No signs of pleurisy nor lung involvement, except a slight bronchitis.

October 3. Patient has had chills and fever every other day since last note. Begin methylene blue, gr. iii every three hours.

October 4. Rise of temperature to 100 1-5 degrees, without chill.

October 20. No fever since the 4th. Patient discharged.

CASE IV. Admitted September 5, 1904.

CHIEF COMPLAINT. Chills, fever and sweats every 48 hours.

PAST MEDICAL HISTORY. Negative.

HISTORY OF PRESENT ILLNESS. One week ago had a headache, which was followed by chill, fever and sweats. This recurred every second day until admission. Has been working on a farm surrounded with swamps and lowlands.

PHYSICAL EXAMINATION. A well-nourished young Russian—face pocked-marked—an eruption of a few discree rose-colored macule-papules, scattered over abdomen, chest and arms. Patient is fully conscious, lies very quietly and occasionally moans slightly. Tongue, broad, tooth-marked, red at tips, whitish coating, unsteady. Abdomen not distended, somewhat tender over liver. Liver, fifth rib to costal margin. Spleen: not enlarged, to percussion or palpation.

September 8. Blood examination. Numerous intracorpuscular hyaline bodies, also pigmented bodies.

September 9. Patient put on methylene blue, gr. ii three times a day.

September 11. Patient had elevation of temperature to 100 degrees, but without chill or other subjective symptoms and is feeling much better.

September 16. Has had no more symptoms of malaria. General condition greatly improved. Spleen, on percussion extends below costal border, but not palpable, anterior border in front of anterior axillary line; some marks of s   on abdomen.

October 3. Patient discharged, cured.

CASE V. Admitted September 7, 1904.

CHIEF COMPLAINT. Chills, fever and headache.

PAST MEDICAL HISTORY. Had the usual diseases of childhood. Had an attack of chills and fever one month ago.

HISTORY OF PRESENT ILLNESS. Eleven this morning had a severe chill, followed by a rapid rise of temperature. He complains of headache and complete anorexia. Bowels are constipated—each chill lasts an hour and a half—pain and. tenderness over spleen, quite drowsy and sleepy and stupid.

PHYSICAL EXAMINATION. Patient a young man complaining of headache, chills and fever, skin hot and burning. Tongue, coated, tremulous, moist, slightly furish at tip. Spleen much enlarged, anterior boundary to nipple line, upper border seventh rib, easily palpable. Liver, fifth space to costal margin. Abdomen somewhat distended, tender in right iliac fossa, no spots. Heart: apex beat fourth space—one-half inch outside nipple line, soft blowing systolic murmur at apex, transmitted into axilla, accentuated second pulmonic. Lungs: doubtful rales left side, back, otherwise negative. No blood examination recorded in this case.

TREATMENT. Methylene blue, gr. ii every third hour.

September 17. Has had no further symptoms since admission.

CASE VI. Admitted September 22, 1904.

CHIEF COMPLAINT. Chills, sweating and headache.

PAST MEDICAL HISTORY. Typhoid fever 15 years ago, otherwise negative.

HISTORY OF PRESENT ILLNESS. Well up to September 10, at which time he developed headache, became chilly and nauseated, vomiting some on this date. Fever developed two days later, i. e., on September 19. Patient took quinine, after which he felt better and resumed work. Patient states that every second or third day since September 10 he would have a paroxysm, consisting of a chill, fever and sweating stage.

PHYSICAL EXAMINATION. Fairly nourished man of middle age, with fever, diminution of urine, high tension pulse. Tongue, some yellowish brown coating, slightly fissured. Abdomen tense and resistant, no tenderness. Liver: area of liver dullness, decreased, seventh rib to costal margin. Spleen: somewhat enlarged to percussion, not palpable.

On admission last night patient gave history of having passed very little urine. Shortly after entering the hospital voided very small amount containing albumin and many casts. Under active diuretic treatment and hot packs, kidney worked better during the night.

September 29. Methylene blue, gr. ii every third hour—first dose given at 2 P. M. Urine at 5 P. M. showed distinct blue color before second dose was given.

November 3. Stop methylene blue.

November 5. Patient had a chill, followed by fever to-day.

November 6. Begin methylene blue again.

November 7. Temperature arose to 100 degrees.

November 12. Has had no fever since the 7th. Stop the methylene blue and

Although so small a number of cases hardly justifies, even in view of the uniformly favorable results, any precise judgment as to the value

(8)

of the mode of treatment, there have been reported by other writers a sufficient number of cases to render possible, at least an approximate judgment of the usefulness of methylene blue in the treatment of malaria. A considerable number of authors have claimed to have obtained very favorable results from use of the drug, but have not committed themselves in a definite numerical statement, but I have succeeded in collecting from the literature 425 cases reported in sufficient detail to be useful.

Reporter	Number of Cases	Attacks Stopped	Relapses	Final Cures	
Ehrlish and Guttmann..	2	2	0	2	
Ollwig	9	8	4	7	
Blatteis ....,..........	35	34	1	33	
Grawitz	1	0	0	0	
Ziemann	3	0	0	0	
Cardamatis 275		—	18	257	
Ketli	5	5	5	0	
Moncorvo	36	—	—	10	Lack details.
Boinet	6	4	1	4	
Smithwick	47	43	1	43	two failures died in a few weeks.
Wood	6	6	1	6	
Total 425		—	31	362	

Floeckinger (Merck's Archives, 1903, Vol. V, p. 13) says that he has used methylene blue in 600 cases,* and places it in the same rank with quinine as an antiperiodic. Cardamatis, who has reported the largest series of cases which I have been able to find in statistical form, regards it as distinctly superior to quinine. This opinion is confirmed by the experiments of Rosin, who studied the action of solutions of quinine and of methylene blue upon the plasmodium of malaria on the stage of the microscope. Rosin found that with the method he employed a solution of quinine of 1 to 5000 was not able to arrest the ameboid movements of the plasmodium, but a solution of methylene blue in the proportion of 1 to 20,000 both killed and stained the parasites.

There have been some authors whose results have not been favorable. Grawitz used it in one case with failure, which discouraged him from trying it again. Ziemann (quoted by Ollwig) employed it in three cases, and states that it had no effect either upon the parasite or the course of the disease. Ketli employed it in five cases with suppression of the paroxysm, but in every case there were subsequent relapses, and he claims that the remedy cannot be regarded as curative. Despite these few unfavorable results, there seems little room for doubt that methylene blue deserves to rank as an antiperiodic, if not

equal in power to quinine, at least far superior to any other drug at present known.

Methylene blue does not produce, as a rule, the dramatic immediate cessation of the malarial paroxysm which is frequently seen with quinine. In nearly every case I have reported there was, after the commencement of the methylene blue treatment, at least one rise of temperature, but this rise was very decidedly less than the previous elevations, and was unaccompanied by the ordinary subjective symptoms which have given to the disease its popular name of "chills and fever." In the 275 cases reported by Cardamatis, in only 18 did the symptoms disappear immediately after the administration of the drug.

The observations of Iwanoff (Deutsche Medicinische Wochenschrift, 1901, Vol. XXVII, p. 281) on the effect of methylene blue on the plasmodium of malaria are very suggestive as to the cause of this difference in the action of methylene blue and quinine. As is well known, quinine, in its toxic action upon the parasite of intermittent fever, attacks principally the chromatin of the organism, and therefore the younger forms of the plasmodium are much more susceptible to its action than the adults. On the other hand, Iwanoff found that methylene blue affected chiefly the protoplasm, and had practically no effect upon the chromatin elements, and the younger forms therefore escaped almost entirely, while the adult protozoa are much more easily killed by methylene blue than by quinine. For the same reasons the crescent form of the parasite, which contains little chromatin and is notoriously very resistant to the action of quinine, is readily destroyed by methylene blue. If methylene blue kills off only the adult organisms it is evident that the younger generations may grow up in small numbers and produce a less severe form of paroxysm, but the constant destruction of the adults must lead in a few developmental cycles to the complete annihilation of the infection.

Particular interest relates to the value of methylene blue in those cases of malaria in which quinine is contraindicated, and of these by far the most important is hemoglobinuria. I have not had an opportunity of personally testing the action of methylene blue in hemoglobinuria, but that it is not irritating to the kidneys is shown by Case VI. This patient was suffering from albuminuria at the time of entrance into the hospital, with partial suppression of the urine to such an extent that he was deemed on the verge of uremia and was treated with hot packs and diuretics. After he had reacted to the antinephritic treatment he was placed on methylene blue, grains three every three hours, which was

continued for 10 days without any aggravation of his renal symptoms. All those who have employed the remedy in black water fever are in accord in the statement that it never increases the hematuria, while many writers believe that methylene blue exercises a directly beneficial action upon the kidneys, apart from its antiperiodic properties. Among the cases reported by Ollwig was that of a man with a chronic malaria, in whom any essay of quinine led to hemoglobinuria, but under the use of methylene blue both the blood and albumen completely disappeared from the urine. In another case reported by the same author, in which, as a result of repeated hemorrhages from the kidneys, the hemoglobin content of the blood had fallen to 50 per cent., under methylene blue treatment there was prompt recovery, and in the course of a few weeks a normal percentage of hemoglobin.

The mode of administration which I have employed has been simply to give the drug in doses of two or three grains every three hours for a period of a week to ten days, and follow by a gradual withdrawal. After a careful consideration I am not at all convinced that this manner of exhibiting methylene blue is not as efficacious as the more elaborate plans which have been offered. One point I would emphasize, and that is the continuance of the treatment over a period of several weeks. The failure to observe this precaution, I believe, has been the cause of many of the relapses recorded.

A number of authors have reported as by-symptoms vomiting, loss of appetite, strangury and symptoms of bladder irritation. These I have not observed in my own cases. Perenski and Blatteis assert that most of the unpleasant symptoms attributed to methylene blue are due to the use of the dye instead of the medicinal methylene blue. Medicinal methylene blue is a different substance from that used as a stain, although closely related to it chemically. The medicinal methylene blue* is the simple chloride of tetramethylthionine, while the dye stuff is the double chloride of zinc and tetramethylthionine. Moreover, the dye stuff contains various impurities, of which arsenic is the most important. One drawback of methylene blue is its vigorously staining properties. Not only the urine becomes a greenish or bright blue tint, but frequently the corners of the mouth and the fingers in handling the pill become stained, occasionally also the saliva is bluish. If the patient should vomit a mass of glaring blue material, unless he was forewarned, it is easy to comprehend the alarm it might cause.

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*Meth-
macope

* *o the eighth Revision of the U. S. Phar-
macope Hydrochloridum.

From the researches of Iwanoff the combination of quinine and methylene blue would seem a quite rational prescription.   In such a formula the quinine would destroy the young forms of the plasmodium, while the methylene blue would attack the adults.   I have not tried this combination personally, but it has been recommended by Dunn and by Floeckinger.

From this brief study I think the conclusion is justified that in methylene blue we have an antiperiodic which rivals quinine in power, and which is, in many cases, to be preferred to that alkaloid on account of its freedom from unpleasant by-symptoms.

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*These could not be included in the table on account of absence of numerical details.

Ehrlich and Guttmann,	Berlin. Klin. Wochens., 1891, Vol. XXVII, p. 953.
Ollwig,	Zeitschr. f. Hygiene, 1899, Vol. XXXI, p. 317.
Parenski and Blatteis,	Therap. Monats., 1893, Vol. VII, p. 16.
Cardamatis,	Deutsch. Med. Wochens. Ther Beilage, 1898.
Ketli,	Abstr. in Schmidt's Jahrbucher, 1894, Vol. CCXLII.
Floeckinger,	Merck's Archives, 1903, Vol. V, p. 13.
Iwanoff,	Deutsch. Med. Wochens., 1901, Vol. XXVII, p. 291.
Moncorvo,	Archives of Pediatrics, 1899, Vol. VIII, p. 244.
Rosin,	Deutsch. Med. Wochens., 1893, Vol. XIX, p. 1068.
Dunn,	Medical World, 1900, Vol. XVIII.

THE PATHOGENESIS OF UREMIA AND ECLAMPSIA.

By ROBERT N. WILLSON, M. D.

Under a rather hackneyed title it is my purpose to discuss very briefly a subject that will always be of interest until the mystery which surrounds the direct causal influences of uremia and eclampsia is entirely and finally dispelled.

None of the theories offered up to the present time has been thoroughly satisfactory in explaining either the uremic state, which seems to be associated always with renal insufficiency, or that of eclampsia, which may or may not be preceded by signs of renal disability, but presents an almost identical clinical picture. I think it fair to state that I have never seen a case of eclampsia in which the urine, drawn by catheter during the coma or the convulsive period, failed to give abundant evidence of a serious renal-involvement. I have seen this statement borne out in cases in which there was neither a trace of albumin nor a single form of renal sediment distinguishable by the microscope prior to the onset of the convulsive seizure. Often the renal insufficiency proved to be temporary, but the regularity with which it has occurred has led me to believe more strongly with each new case that uremia and eclampsia are identical states, brought about in similar ways, though under many widely variant conditions. This does not mean (and I would emphasize the point) that they are necessarily the result of kidney disease. It may be that even constipation, or an abnormal condition of the thyroid gland, or of the placenta, may in certain instances influence the particular case more forcibly than the impairment or integrity of the renal function.

It is not my object, however, to discuss the similarity of uremia and eclampsia, but to suggest a coincidence of two causes for both conditions which have been brought forward separately by more than one writer, and studied by very many.

The first of these is the action of a toxin or of
dois calls the pschychomotor centres of th
a mechanical pressure upon the same

combination with the toxin, or occasionally alone, but not in the manner
held by Traube, viz.: an effusion into the ventricles and consequent
anemia of the brain.

That toxins, and even certain substances which can hardly be placed
in this category, may produce by their local action the complete symp-
tom complex of uremia, including coma or convulsions, followed by
death or recovery, has been shown beyond a peradventure by the ex-
haustive research of Landois (Uremia, 1891, second edition.)   Wei-
senberg's recent report (Proceedings Path. Soc. of Phila., Feb., 1904)
of extensive chromatolysis of the Betz cells of the paracentral lobule,
especially on the side opposite the paralysis, in two cases of uremic
hemiplegia, is another indication of the presence and action of a poison
destructive to the central nervous system.   The cells in the anterior
horns of the cord, also in the medulla, and in the cerebellum, were
found to show positive alteration, as well as the fibres of one motor
tract.   The extensive lesion in the posterior portion of the left hemi-
sphere of Case III of the series cited in this paper was more than pos-
sibly a gross destructive process of the same nature.   Among many
clinical evidences is the amaurosis which can occur in both uremia or
eclampsia in the absence of any evident ante- or post-mortem lesion
of the nerve.   It has been shown that even the injection of large
quantities of common salt solution into the blood may produce the
symptoms of uremia.

I have found it equally true that many of the symptoms noted in
both uremia and eclampsia resemble pressure symptoms, and can be
controlled at once by relieving pressure upon the central nervous sys-
tem.   I am led to believe, therefore, that while the toxin theory may
provide a partial explanation of the uremic state, there is at times, or
perhaps always, another important influence at work in the form of
intracranial, and probably localized pressure upon the psychomotor
centres.   Among the symptoms that may be ascribed to intracranial
pressure are the following, all familiar to the student of uremia and
eclampsia in the absence of any evident ante- or post-mortem lesion
ness, nausea and vomiting, neuralgias, tinnitus aurium, coma, convul-
sions, cyanosis, paresis, paralysis (sometimes hemiplegia), aphasia,
loss of control of bladder and intestines, and, most sudden and start-
ling of all, amaurosis.

The following three cases, briefly cited, illustrate partially the
"pressure theory" and the results of therapeusis based upon the same:

Case I.—M. R., a woman of 50 years, was admitted to the Philadelphia Hospital in March of this year (1904). Her feet and legs were edematous, her breath was urinous, control of the sphincters was lost, and the patient was semi-comatose. The temperature was 97 degrees F. The urine contained 3.2 grams of albumin per litre, and many hyalin and hyalogranular casts. Two days later the temperature rose to 103 degrees, the breathing became very labored, and death seemed imminent. Lumbar puncture was performed, and nearly twelve c.c. of colorless, clear fluid withdrawn from the spinal canal. The respirations at once became easy, the pulse fell from 110 to 84, and although the patient was past all help when the puncture was performed, the cerebral relief was evident during the last two hours of her life.

The spinal fluid was examined by Dr. Rosenberger, and was found sterile. Small quantities were injected into guinea pigs, intraperitoneally, but with no untoward result.

Case II.—R. B., a man, about 40 years of age. His mother had died of nephritis. The patient had had syphilis 15 years before. He seemed fairly well until two weeks before admission to the Philadelphia Hospital, in April last. He was then dyspneic, and had extensive edema of the feet and legs, and to a lesser degree of the entire body. Just after entering the ward the patient developed a pulmonary congestion, expectorated traces of blood, etc., and became very dyspneic. This condition decidedly improved during the following two days, in spite of a double valvular cardiac lesion (mitral and aortic). He began to complain of severe headaches, and then gradually developed a uremic condition. At times he was comatose, and again so delirious as to require restraint in bed. The breath was urinous, the faeces were at times involuntary, the reflexes almost disappeared, the pupils contracted, and Cheyne Stokes breathing made its appearance. The urine contained large quantities of albumin and numerous pale granular and hyalogranular casts.

Lumbar puncture was performed. Prior to performing the operation the pulse was 90, and the respiratory rate 33. Fifteen cubic centimeters of clear fluid were drawn, and three hours later the pulse was 50, and the respirations 23. Immediately following the puncture the patient began to breathe quietly and more regularly, and a peaceful sleep ensued. The opening into the spinal canal, though covered with compresses, continued to drain, and at such a rate as to wet the bed clothes for more than two days. During this time there was a decided general improvement, the patient being conscious and fairly comfortable. He then went into delirium and died during the ensuing night.

The autopsy in this case showed aortic and mitral insufficiency, atelectasis of the lower left lobe, subacute parenchymatous nephritis, and red atrophy of the liver.

The spinal fluid was cultured, and, like that of Case I, proved sterile. Injections were also made into guinea pigs, but proved innocuous.

Case III.—B. P., a colored clergyman, aged 50. His father had died of ꞏꞏtumor. His own early history was negative until two years ago, "slight stroke of paralysis" (probably a uremic seizure) in the leg. He was in the hospital three weeks, and then was discharged free use of his right side. He had recently had headaches

for two months, especially severe during the last week. Eighteen hours prior to admission there was severe vomiting, followed by unconsciousness from which he could not be aroused.

On admission he was unconscious, his breathing stertorous, the pupils slightly dilated (later contracted), the pulse rapid and of high tension, his temporal arteries resembling fibrous cords, both as the result of sclerotic change and of the tension. The second cardiac sound was loud and metallic, the legs slightly edematous, the breath urinous. The patient was restless and swallowed fluids with difficulty. The catheter obtained six ounces of pale urine, which contained large quantities of albumin, no sugar, many hyalin and hyalogranular casts. There was also incontinence of urine. The respirations assumed the Cheyne-Stokes rhythm soon after admission to the ward.

Lumbar puncture was performed the following morning. The spinal fluid at first spurted out, instead of dropping, as is usually the case. It was clear, and soon began to drop, continuing to do so for over an hour. About 25 cubic centimeters were withdrawn. Before the fluid had ceased to flow the Cheyne-Stokes respirations had been replaced by slow full breathing, the patient was quiet, and on replacing him upon his back his attention could easily be attracted by the voice or by the finger moving before his eyes.

The wound in the tissues was allowed to bleed profusely in the hope of further reducing the vascular and systemic tension, and a pint of blood, approximately, was withdrawn in this way.

On the following morning his condition was fairly good, though coma had again set in. Lumbar puncture was again performed, and on this occasion only ten c.c. dropped slowly into the tube. The same result was noted, however, and following the procedure the patient was partially out of his coma, and the pulse, temperature and respirations soon began to fall. Prior to the puncture he lay stupid, with the left eyelid ptosed, evidently paretic, and with the right eye wide open, but unresponsive to the finger touching the cornea. Following the withdrawal of the fluid both eyelids opened wide and the eyeballs followed the finger. On the third morning the coma was as deep as at any time. Even less fluid was obtained by the third puncture (less than ten c.c.); it contained blood, and dropped with great slowness. There was an even more decided fall of temperature, and of the respiratory rate, but the pulse rapidly rose, and the patient died at 9 P. M. on the same evening.

It should be stated that the patient, on admission, received two hot packs, following which all his symptoms were more pronounced. He was thoroughly purged from the start, was bled twice and received one high enema of magnesium sulphate solution. During his last 36 hours his skin was bathed in a profuse perspiration. Nitroglycerin was administered hypodermically during the last 24 hours. In short, every reasonable treatment was resorted to except the use of aconite, which the writer would certainly employ in another similar case. In spite of every effort, only the lumbar puncture seemed to afford any relief, and death finally ensued.

The autopsy showed a most interesting state of affairs. The heart was of the cor bovis type, the wall of the left ventricle measuring 4 cm. in diameter, and that of the right ventricle 2 cm. The coronary arteries were sclerosed and

lined with yellow patches of atheromatous change. The kidneys showed an extensive chronic diffuse inflammation, the cortex being greatly reduced, and, the parenchyma showing many small cicatrices due to fibrous change. The brain was of normal size, and presented a large degenerative cyst mainly of the parietal lobe, but also including a portion both of the temporosphenoidal and occipital lobes—entirely posterior to the fissure of Rolando. The cyst contained a considerable quantity of serous fluid, together with a large clot of dark red blood. The cyst cavity communicated with the posterior horn of the left lateral ventricle, though whether as the result of trauma to the friable and degenerated tissues sustained in removing the brain, or whether it existed in vito, cannot accurately be determined. The right lateral ventricle was also greatly dilated, especially the posterior horn, which contained, when opened, considerable serous fluid. The arteries of the base were brittle, and remained gaping and open when incised. This was also a feature of the renal arteries, including the smaller branches within the organ.

From my experience in the foregoing cases I am, as already stated, compelled to pause before accepting Landois' well-known statement that "uremia is the result of the toxic influence of certain substances upon the brain," as a complete and satisfactory explanation for the uremic and eclamptic states. This reluctance extends equally to the theories under favorable consideration at the present time, as, for instance, that of Novi, dependent upon concentration of the blood and cerebral anemia, and to that based upon the experiments of Weighard with syncytiolysins, and to the still more recent and fascinating idea that impairment of the thyroid functions is at the bottom of the eclamptic condition. Any one or all of these conditions may have something to do with the complete and typical picture presented in the uremic state. In fact, I suspect that in certain instances more than one may play a part. Certainly, however, we must reckon with another factor, namely intracranial pressure, and it may be that further study will show that this is the most potent of all. In favor of this view we have first the immediate (although temporary) alleviation of symptoms in each of the three cases reported in this paper, and a less prompt but similar (and permanent) betterment in cases reported by other observers (McVail, British Med. Jour., 1903, et al.)   In Cases I and II the improvement could be ascribed to relief from some form of fluid pressure only.   Case III, while more interesting because of the complicating cyst, presents a doubt as to whether the relief was one from local pressure upon the psychomotor centres only, or from that pressure exerted by the fluid contained in the cyst cavity.   If the 'eed communicate with the left lateral ventricle, as was effect of spinal drainage was a double one, and low-

ered the general and local intracranial pressure at the same time. The previous hemiplegia, so evidently uremic, renders the nature of the second attack more plain than it would otherwise be, even in a subject with so evident a renal disability.

Among the symptoms from which relief was afforded, presumably by the flow of cerebrospinal fluid, were in Case I the rapid pulse, the labored respirations, and the restlessness, the delirium, coma and dyspnea in Case II; the coma, ptosis of the eyelid, temperature, pulse, respiratory rate and character (Cheyne-Stokes type), in Case III.

As far back as 1850 R. B. Todd cited a case in his Lumleian lecture (page 42) showing a low delirium, then a paralysis of the arm and leg, coma and death. At the post-mortem examination there was found an effusion of lymph in the "arachnoid sac of the left side, covering the upper and inner surface of the hemisphere to the level of the base, but ceasing there abruptly, so that not the smallest particle of lymph was found on the arachnoid of the base. An accumulation of fluid had taken place in a cavity, circumscribed by lymph, on the outer side of the left ventricle, near the position of the fissure of Sylvius. The fluid which had accumulated here compressed the brain on the left side, and formed a complete depression on its surface."

The autopsy findings in Case III differed from the foregoing only in the location of the fluid and the surrounding degeneration of the brain substance. There was in both cases the same form of intracranial pressure from fluid, the presence of which was most easily and naturally referable to the cause of the general condition. The only wonder must be that this pressure in Case III could be exerted so close to the motor centres and yet spare the functions of the extremities and the musculature in general. Such cases prove, in any event, that serous fluid may be in excess, either locally or generally, in the cranial cavity, and by its presence may at least assist in causing the uremic picture. No reference is had in this statement, of course, to the serum frequently found between the convolutions in the brains of senile subjects. We know further that the uremic state occasionally presents complete paralysis of one portion or even of the entire half of the body. Case III had already exhibited the hemiplegia, and during his last attack there was present a probable paresis of the oculomotor nerve.

In studying these suggestive series of facts it would appear certain that in drawing the cerebrospinal fluid, with either prompt or delayed, but positive, relief from symptoms which we know may be caused by

localized intracranial pressure, we relieve these symptoms by depleting the excess of fluid, whether contained in the ventricular cavities, or in the brain tissue itself, or in spaces made by the fluid for its own accommodation.   Gowers (1893, Vol. II, p. 102) has called attention to the fact that a dog becomes unconscious "when there is a pressure on the surface of the brain equal to a column of mercury 130 mm. high." Moreover, the autopsy frequently shows in cases   of   uremia   and eclampsia an edema of the cerebral tissues.   It is easily conceivable from a study of these cases that sometimes the edema may involve the cortex more seriously than other portions of the brain, or even one psychomotor centre more positively than another, and thus produce aphasia, paresis or paralysis of the extremities, headache, coma or convulsions.   A decrease in the intracranial fluid pressure resulting from the withdrawal of 20 to 30 c.c. of cerebrospinal fluid may relieve just such a localized edema, and alleviate strictly local symptoms.   The evacuation of the normal quantity of cerebrospinal fluid may have the same beneficial effect, when an abnormal quantity, or some other cause of intracranial pressure is in evidence.   We have seen an effusion form and reform after tapping, and can thus understand the early recurrence of pressure signs in hopeless cases of this nature.   The word hopeless leads me directly to the remark that we must again agree that intracranial pressure is not the only influence at work in the production of the uremic and eclamptic states.   Otherwise a case that has been freely purged, and still more freely bled, and from which all the obtainable cerebrospinal fluid has been withdrawn, should secure a permanent rather than a temporary relief from serious symptoms and death.   The effect of toxic substances could not, of course, be done away with even for a time, by lumbar puncture; none the less, symptoms due to pressure only should be more easily and lastingly amenable to treatment.   In short, there are too many indications of a toxic influence upon and in the system, such as the dry skin, the itching, the hypertension of the vessels, etc., and, above all, the effect of local applications of chemical substances to the psychomotor   centres, as already quoted, for us to ignore the likelihood of a systemic and local intoxication.   Thomson claims that at least one particular poison present resembles adrenalin in its action, constricting and increasing the tension in the vessels and the result of clinical study would seem to bear out   has produced the complete picture of

ons by applying to the cerebral

ate, leucin, sodium chlorid,

etc., etc. With the absorption of the substance the attacks grew slighter and slighter, and perfect recovery at times ensued.

Weighard also claims to have produced similar results by the injection of artificially prepared syncytiolysins in blood serum, and in his subjects he found post-mortem typical lesions of uremia and eclampsia—anemic and hemorrhagic liver necroses, thromboses of the small vessels, and cloudy swelling of the renal epithelium. Novi has accomplished almost as much by the injection of a 10 per cent. solution of sodium chlorid, until the blood attained a concentration twice that of the normal.

It is interesting to note that in spite of these facts the injection of the cerebrospinal fluid from uremic subjects into small animals seems to have no deleterious effect.

In conclusion it may be said that we consider:

I. That it is probable that there are at work in the cerebrum, as well as throughout the system, of uremic subjects at least one, and probably several toxic substances, which exert their influence more or less locally upon the cortex.

II. That it is equally certain that other portions of the brain than the cortex are also acted upon, as in the production of coma, etc.

III. That no small part in the production of the uremic and eclamptic condition is played by intracranial pressure, due to a temporary excess of fluid, whether acting independently of, or in conjunction with, the toxic substances already mentioned.

IV. That lumbar puncture will at least temporarily relieve certain of the symptoms most readily ascribed to localized intracranial pressure; and that the cases in which the pressure is the main factor, drainage of the spinal canal may save life. The procedure, together with free bleeding, purging and diuresis, should be added to our routine treatment of the condition.

V. That transfusion of normal salt solution by intravenous injection or hypodermoclysis, except in cases presenting anuria, or a greatly diminished urinary secretion, is contraindicated, as tending to increase intracranial pressure and the liability to saturation of the cerebral tissues.

VI. That the results of lumbar puncture in the three cases cited in this paper will not warrant the assumption that relief of intraspinal or intracranial pressure can alone be depended upon to cure the uremic or eclamptic condition, provided the toxic influence is the prominent one in the particular case. (*Vide* subsequent publication in Journal American Med. Asso., July 1, 1905.)

A CASE OF SENILE MULTIPLE NEURITIS.

By J. W. McCONNELL, M. D.

The occurrence of multiple neuritis in the aged is unusual and when it is observed without the presence of the commonly ascribed causes, i. e., alcohol, drug or other acute poison, it is sufficiently rare to warrant the presentation of a single case for study as to the etiology of the condition and its symptomatology. By most authorities multiple neuritis is considered as essentially a disease of early adult life and of infrequent happening after the fifth decade. In the senile we occasionally find lessened sensibility; decreased activity of the skin; and weakness of the musculature caused by the simple parenchymatous degeneration and atrophy of nerves. These symptoms, however, are unaccompanied by pain, either subjective or objective, or by tenderness. The senile victims of the common type of multiple neuritis are, as a rule, found to be sufferers from chronic rheumatism, they are abusers of alcohol or occasionally they are the ivctims of autochthonous poisons. Compared with alcoholic multiple neuritis and other less common varieties of the disease senile polyneuritis seems to differ in the gradual and somewhat unusual onset, the irregularity in the intensity and distribution of the pain and in the inconstant motor and sensory conditions.

1864, Dumésnil, in the paper in which the pathologic changes found in multiple neuritis were first described, told of a man of 71 years, with arteriosclerosis, who, after two weeks of tingling of the toes, developed numbness of the left foot and right upper limb. Later the left upper limb and the right lower extremity became involved. Still later he pres— to paralysis of the four limbs, more in one than a of the muscles of the hand. In this case onset, the irregularity in the int in a measure, exclude it

Six cases were reported in 1893 by Oppenheim in a paper on the senile form of multiple neuritis. Of these five were men and one a woman, the ages ranging from seventy to eighty-two years. The peculiarities already noted were present and additionally Oppenheim remarked the tendency toward remissions and to a very chronic course. He advanced as characteristic symptoms the absence of the usual etiologic factors, the decidedly chronic course, the insignificant subjective pain, the non-involvement of the cranial nerves.

Stein's cases reported in 1897, presented pain, hyperesthesia and diminished tendon reflexes without palsy, atrophy or ataxia, and he therefore concluded that a classification should be made to include those cases showing a preponderance of subjective pain.

In studying the etiology of senile polyneuritis arterio-sclerosis presents itself as the most tangible causative factor in the absence of toxic or cachectic agencies. Gowers calls attention to the variety of polyneuritis which he has designated arterio-sclerotic multiple neuritis, in which the lack of customary symmetrical distribution is the prominent feature. This lack seems to have been the fact in most of the recorded cases of senile polyneuritis and in those in which such was not the case the motor and sensory losses, if we can so speak of them, were imperfectly developed. The arterio-sclerotic process probably acts by occasioning failure of nutrition in the trophic spinal apparatus and the peripheral nerve trunks. Oppenheim himself, the first to describe senile multiple neuritis as a distinct disease, states that senility may produce degenerative processes in the peripheral nervous system due to arterio-sclerosis or perhaps to an obliterating arteritis.
arterio-sclerosis seems the most plausible etiologic agency in senile

Regarding every man as old as his blood vessels show him to be arterio-sclerosis seems the most plausible etiologic agency in senile polyneuritis. The following is illustrative of the somewhat aberrant symptomatology and of the etiology of such cases.

L., a blacksmith, of seventy-five years, for many years an inmate of Blockley, was admitted to the nervous wards of the Philadelphia General Hospital, November 23, 1904, complaining of pain in the extremities and inability to walk. He denied venereal disease, had not indulged in alcohol for many years, but claimed to have suffered from rheumatism for twenty years. He had been in the medical wards for six months previous to admission to the nervous wards, suffering from cardio-vascular disease, and his general physical condition was very poor. The patient's statement was that six months before admission he had numbness and tingling in the distal portion of the limbs, first the upper then the lower. These paresthesiae were quickly supplanted by burning, shooting pains in the same localities and up the limbs to

the knees and to the elbows. The pain in the feet was increased by attempting to stand and dependence of either upper or lower limbs intensified his suffering. He was never paralyzed.

Examination showed great weakness of both upper and lower extremities; inability to walk; static ataxia; diminished, almost lost, tendon reflexes; great pain on pressure over nerve trunks and muscle masses; marked tremor of the hands and fingers. He had no loss of power in individual muscles or muscle groups, the weakness being of the limb as a whole. He had slight ataxia of the upper extremities. The pupils were equal and responded normally; ocular movements were good; bladder and bowels were well controlled. He did not have any loss of tactile or pain sense; there was no redness of the extremities; no intermittent lameness. His blood vessels were markedly sclerotic.

Improvement in his special condition followed the betterment of his general state and six weeks after admission to the nervous wards his neurologic symptoms were pain over the nerve trunks and muscle masses, especially of the lower extremities; depressed tendon reflexes; some static ataxia. There was relative weakness of the right upper limb and some wasting of the thenar eminence and interosseous spaces of the right hand. By actual measurement the right was one centimetre smaller than the left hand. This was the only suggestion of atrophy that could be found. He complained greatly of the paresthetic condition of the fingers and toes and of an intense itching of the feet, which was unaccompanied by any skin eruption.

A CASE OF RHIZOMELIC SPONDYLOSIS.

Service of Dr. Charles K. Mills.

Reported by Dr. Ralph Pemberton, Resident Physician.

The patient's father was a Russian, and died at 49 years of age, after an illness of one month in bed, with swelling of the legs.

The patient states that he has been told that his father was subject to rheumatism. His mother is living and well at 50 years of age, and two sisters, aged respectively, 35 and 37, and one brother of 25 years of age, are also in good health. There has been no other death in the family, and apparently no family diseases.

The patient was born in Russia; denies all diseases of childhood except measles, and states that he has had no venereal disease or illness of any other kind beyond the present one, and had never been in a hospital until admitted for his present complaint.

He used liquor very moderately and tobacco to slight excess.

Nine years ago he was married, and has three healthy children, his wife being a healthy woman, having had no miscarriages as far as he knows. No children have died.

He came to this country when 16 years of age, and for about four years worked steadily at cap-making, bending over his work all day long and getting no exercise; his duties consisting in feeding the various pieces of cloth to the machine, which sewed them together.

He next took up huckstering, at which occupation he worked for one year, and did a great deal of walking, pushing a cart around the city or standing in one place with his wares, always out in the open, but never exposed, he says, to very stormy weather.

In the course of six months he began to feel below par, though just how is hard to determine beyond the fact that he had pain in his right leg from the hip to the knee. In a few months more his left leg became similarly affected, and the pains in both increased in severity, though not sufficiently to cause him to cease work, and it cannot be ascertained that any other parts of his body were then involved. Shortly, however, after a total of one years of out-of-door work and exercise, he was admitted to the Jewish Hospital, where, with one or two brief intermissions, he has been for nearly three years. While there he says he developed stiffness of the shoulders, both hips, neck, back and knees, though he does not remember the order of involvement, or even which was first. He was in bed for most of his stay at the hospital, but for the last few months had spend the days in a wheel chair.

Examination.—A moderately emaciated male of about 35 years of age, with light-brown hair and intelligent expression. He wrinkles brow in all directions, draws mouth to both sides, shows teeth evenly and whistles normally. Patient stands without support, sways slightly with the eyes closed and slightly more with the eyes closed very tightly.

As he stands the legs are held stiffly, the trunk is inclined forward from the hips and the upper portion of the trunk with the head is thrown directly forward to an angle of about 120 degrees with the rest of the body. The neck is almost perfectly rigid, and the man's body can be raised by raising the head with a hand under the occiput, the only possible motions being a rotation of the head of about 15 degrees to the right and about 45 degrees to the left, and a slight depression and elevation of the same.

The eyes look toward the floor except that, when he is talking to some one, they are rotated upward to counteract the downward inclination of his head, and enable him to look anteriorly on a level with his own head. The jaws can be opened fully wide and can be closed tightly.

The trunk cannot be straightened, and he cannot walk without the assistance of crutches, but with them he pushes his feet forward one after the other, bending the knees but slightly, and apparently not moving the legs at the hip joint. After a few steps of this kind he swings both the limbs forward together in a pendulum-sort of gait.

In sitting there is no movement at the hip joint whatever, the body resting on the chair with the tuber ischii almost on the edge of the seat and the shoulders against the uppermost part of the back of the chair, other portions of the body not touching it.

In rising the patient lifts himself by the arms, making no attempts to bend the knees as a normal individual would, but rather keeping himself from slipping back into the chair by fixing the heels against the floor. The eyes show moderately dilated, but equal pupils, which react promptly to light and accommodation, and the extra-ocular movements are good in all directions. The tongue is easily and evenly protruded and of normal aspect. The pulse is regular and of good volume.

The chest presents great deformity, giving the appearance of being sunken in at the sides, and long and narrow, while the clavicles extend almost directly backward instead of laterally, and slightly backward from the sterno-clavicular articulation. The shoulder joints are unduly thrust forward, the spaces between the heads of the humeri and the clavicles very sunken, and the shoulders, as a whole, are extremely narrow, the most anterior parts of the humeri being but 25 cm. apart. Posteriorly there is bulging about the angle of the ribs on both sides, particularly the left, throughout the whole length of the thorax, making the posterior aspect flatter than normal and broad at the base.

From the back the sides of the chest run abruptly forward and inward, making an angle of about 40 degrees with the plane of the back, so that a cross section would give a figure broad of base, the sides slanting at an angle of about 40 degrees to the apex, which is about one-half the length of the base line.

The expansion of the chest seems about equal and slight on both sides. The apex beat is rather diffuse and easily visible in the fourth interspace, and one inch outside of mammary line.

The apex beat is forceful and diffuse, but without thrill. Cardiac dullness is easily elicited, extending from the third rib and left edge of sternum to about one inch outside of the nipple line. The first apical sound is of very fair timbre and the second valvular sound apparently normal. The lungs give a good note anteriorly to percussion, and seem clear on auscultation. The breath sounds are easily audible and rather harsh.

The abdomen is slightly, but not unduly protuberant, bulging moderately in the flanks. It is soft except when he lies on his back, and his head is unsupported, when the abdominal muscles assist apparently in maintaining his position, though without conscious effort on his part. As soon as the head is well supported they relax.

Both arms are somewhat wasted, the right considerably so, and the bellies of the biceps muscles, particularly the right, stand out prominently on either side. The right arm cannot be circumducted at the shoulder, and attempts at motion, passive or active, beyond the angle of 50 degrees with the axis of the body, either laterally or anterio-posteriorly, meet with pain and firm resistance, both apparently in the shoulder articulation. The right arm cannot be fully flexed, the tips of his fingers being 5 cm. from the point of the shoulder when flexion is greatest. The motions of the left arm are fairly good in all directions, except directly upward, and he can touch the point of his left shoulder easily with the tips of his fingers. There is distinct wasting of the muscles of the right shoulder joint, particularly the supra- and infra-spinati, the deltoid, the biceps, trapezius and the latissimus dorsi. There are no fibrillary movements, but at times there seem to be fascicular tremors in the muscles of the right upper arm and in the infra-spinatus and pectoral regions.

The grasp of the two hands is very good, while the movements of the forearm and hand can be well performed; but muscular power in the upper extremities is much below normal—that of the right arm being much less than that of its fellow. There is no motion at all at the hip joint, and no atrophy of the lower extremities. The knees can be bent until the legs make an angle of about 45 degrees with the thighs, but effort to proceed further causes pain. Motion of the feet, ankles, toes, hands, wrists and fingers seems good, and there appears to be no wasting of the muscles connected with them. The reflexes of the upper extremities are apparently normal, and the patellar reflexes are present, but the excursion of the limbs is not very great because of the rigidity of the knee joints. Plantar flexion of the great toe results from all forms of stimulation to that end, and there is no ankle clonus. Achilles jerk is present and sensation is apparently normal everywhere in all its forms. Examination of his urine yields negative results. Since admission to the hospital the patient has had no rise in temperature. His bowels have been regular, and he has eaten and slept well.

Fig. 1.

Fig. 2.

Fig. 3.

THREE CASES OF MENTAL DISORDER ASSOCIATED WITH MULTIPLE NEURITIS (KORSAKOFF'S DISEASE).

From the Neurological Services of CHAS. K. MILLS, M. D., and WILLIAM G. SPILLER, M. D..

Reported by DR. S. A. CARPENTER, Resident Physician.

WITH REMARKS BY DR. MILLS ON THE POLYNEURITIC PSYCHOSIS.

CASE I.—M. M., age 42, white, a domestic, was admitted to the women's nervous wards of the Philadelphia Hospital, July 28, 1904.

The family history contained nothing that would throw any light on the present condition. She had the ordinary childhood diseases, was married at eighteen years, gave birth to nine children and had three miscarriages, the last miscarriage six years ago. She had drunk beer and whisky moderately since being married. She was always of a lively, jovial disposition up to nine months ago, when she became depressed because of the "wrong doings" of a grownup son. She then began to drink more heavily, and grew continually more careless and dissipated, drinking whisky constantly.

The onset of the present trouble dated back to about nine months previous to her admission, when she began to complain of pain in both lower extremities. While marketing two months later her limbs suddenly gave way; she fell to the ground, and had to be carried to her home. She remained in bed four weeks, and during that time complained of some numbness in her feet. After she got out of bed she soon became able to walk as well as ever after she got started and limbered up; getting upon her feet has been difficult. If she walked any great distance she complained of painful cramps in her calves and in the posterior thigh muscles. The difficulty in rising increased, and three weeks before admission, while going to the home of a friend four squares distant, she fell again and had to be carried home. From that time until she was admitted she was practically unable to walk, sitting in a chair most of the time. Since her last fall she had complained of "pins and needles" sensation in her lower limbs, and on the day previous to her admission she remarked that her finger tips were as sore as boils. She said her sight began to get poor about four months previous to her coming to the hospital.

About four weeks before admission it was noticed that her memory for recent events was becoming clouded and continued so up to her admission. For a few days before her admission she is said to have thought that she saw people when they did not exist, and she also mistook people and objects.

On admission the patient was found to be a well-nourished and well de-

veloped female. There was paralysis of each external rectus, this being the only symptom referable to involvement of the cranial nerves. It might be stated here that no history of venereal disease could be obtained. A soft systolic murmur could be detected at the apex; the other special organs showed no abnormalities. She arose with difficulty on being asked to walk; she showed extreme weakness, and after walking a few steps her limbs gave way; her station was very poor, more so with the eyes closed. She also had diplopia. The pupils were moderately dilated and responded promptly to light and accommodation. Sensation to touch and pain appeared normal all over the face.

There was no apparent atrophy in either upper limb; motion was free in all directions; resistance to passive movements was diminished on both sides; the biceps, triceps and wrist reflexes were present, but lessened on both sides. There was some tenderness to pressure over the nerve trunks of both upper limbs, this being more marked on the right side. Sensation to touch and pain seemed to be normal on both sides; sense of position was retained; both limbs showed slight ataxia.

The lower extremities did not appear to be wasted; motion was fair, but resistance to passive movements was decreased on both sides; both patellar and Achilles tendon jerks were absent, even upon reinforcement; ankle clonus and the Babinski response were not obtainable on either side; there was slight tenderness on pressure over the nerve trunks from the knees down, but not in the thighs. Sensation for touch and pain was normal; sense of position was not affected; ataxia was present in both limbs.

Sensation for touch and pain was normal over the chest. The patient had never had any girdle sense nor any bladder or rectal disturbance.

About a week after admission (August 5) the external rectus palsy on each side cleared up, but she then developed nystagmoid movements on lateral excursions of the eyes. A short time after this she developed double foot-drop and wrist-drop. The pain and tenderness of the extremities became steadily worse until the weight of the bed clothes caused her agony. About September 25th incontinuence of urine and feces set in for the first time.

The mental symptoms of the patient were so diverse and variable in character, so far as her hallucinations and delusions were concerned, and were so continuous over a long period, that it will save time to pick out for illustration some of the features of her mental condition at intervals; in other words, I shall give as nearly as possible the forms in which the patient expressed a few of her many delusions and false reminiscences.

Late on the night of August 10th she began to plead with a policeman to discharge her son, who had been arrested. The next morning she said she had given birth to a child and was glad that it was born, though she did not have much pain.

On August 16th she said she had scrubbed the whole building in which she was, but that she had not been paid for it; she also said she had washed and ironed a number of towels. She had at one time been a janitress, and prob-

ably thought that she was still employed in that position. She thought she had a thread in her hands and proceeded to wind it about her fingers. When visited the next day she said she had given birth to a baby on the previous night, and some one took the baby to bury it, and she said she was still flooding. The next night she said she had given birth to twins, but one died, and a boy came in and cut the throat of the other. It was so small that it was buried in a small coffee pot.

Every sound or scream she heard inside or outside the ward she associated with some accident to some of her own family. For instance, she heard some crying outside; immediately she began to cry and became greatly affected, saying it was her husband, who had come home drunk and had fallen downstairs. (Her husband had been dead for a year.)

A few days later she suddenly began to cry, screaming that a man was in her bed, sticking pins in her legs and otherwise maltreating her. On September 6th she again said she had given birth to a child, that she sent for a clergyman to baptize the child, but he was out, and in the meantime it was baptized by a neighbor. Another of her delusions was that she had given birth to a dog, but she also said that she had never had any connection with a dog.

She continued with these strange delusions and hallucinations, often variable and often accompanied with considerable excitement, for several weeks, her mind not appearing to clear up. It was noticed that her latest delusion was that mice and snakes were going back and forth on the floor. She often complained of snakes being wrapped around her legs. Her mind was still much confused, at times she was hilarious and in a few moments would become much depressed.

About a month after admission her pulse became exceedingly rapid, going as high as 130 and remaining there for about three weeks. About November 1st and for several weeks preceding that date it was running about 90 to 108. Incontinence of urine and faeces had continued during the past month. She had greatly improved as regards her neuritic symptoms, but the reflexes were still absent and she was unable to stand. She had double foot-drop, but power in her extremities had considerably returned, more so in the upper limbs. She was able to overcome the wrist-drop on the left side; she had only slight tenderness on pressure over nerve trunks. Her extremities and face had become markedly wasted.

CASE II. M. F., age 32, white, was admitted on September 14, 1904. She denied specific disease, and had had no miscarriages. She had drunk coffee in large quantities all her life, and for the past six years had been a heavy beer-drinker. About six weeks before admission she gave birth to a full-term child, which died after five weeks of enteritis.

The present illness dated back to about three months previous to her admission, when she first noticed a numbness and tingling in her lower extremities from her knees down; shortly after this she noticed that she was gradually becoming weak, and that she tired easily. She never experienced any pain until after the above-mentioned confinement, when after the first week of her puerperium, on attempting to leave her bed, she discovered that she was unable to stand, and then for the first time complained of pain in her

lower limbs. Up to the time of her admission there had been no involvement of the upper limbs; she had been troubled with constipation for two weeks before coming to the hospital, and for the first time was catheterized on the evening of her admission. She said her sight had been failing for six months before she was admitted.

Examination shortly after admission showed double foot-drop; both knee jerks absent, and Babinski not obtainable on either side; an attempt to obtain ankle clonus produced acute pain; both feet were cold, and the soles were somewhat moist; sensation to touch and pain was apparently normal.

Her memory for recent events was extremely poor; even though she had been in the hospital only twenty-four hours she was unable to say how long before she had been admitted, and she was never able to remember whether or not she had had her meals, even though she had eaten a few hours before. Two days after her admission, on being asked if her bowels were opened that day, she replied in the negative, while her nurse had recorded two movements on her chart; again she was unable to name properly the articles of diet which she was taking, always giving the names of different foods which she had never had.

About September 27th she began to have periods of excitement, during which she would shout terrible oaths and use very vile language. On October 6th she said she had been up and around all day, and had been down town in the morning; at the same time she was scarcely able to move in the bed. She complained of much pain in her hands, but otherwise said she was feeling pretty well. On October 12th it was noted that she still continued to curse and to use vile language. On November 7th, while the interne was in the ward taking some notes, the patient said she was not able to go down town to have her pictures taken, but would go to-morrow. She talked in a mumbling or muttering manner, which could seldom be understood, and for this reason many of her delusions could not be recorded.

About September 25th she developed incontinence of urine and feces; tenderness over the extremities had become almost unbearable; there was complete double wrist-drop, and she had become somewhat wasted both in the extremities and about the face. On November 11th the above symptoms were all present and exaggerated. On lateral excursions of the eyes nystagmus was produced.

On October 10th Dr. Shumway reported extra-ocular movements good in every direction; the pupillary reactions prompt. Ophthalmoscopic examination showed a perfectly normal eye ground on each side.

On admission the patient was a well-nourished and well-developed female. There was a slight double external rectus palsy, but the patient said this had existed since childhood. She was also unable to converge with the right eye. During convergence other than this there was no evidence of cranial nerve involvement.

Another examination showed the following: Sensation to touch and pain was normal over the face; the special organs of the chest and abdomen showed no points that would be of any value in recording the nervous and mental phenomena of the case. The muscles of the hand, especially the dorsal interossei,

showed some slight wasting; otherwise the upper limbs appeared well develop-
ed. Motion was present in all directions; resistance to passive movements was
much decreased in both extremities; wrist-drop was present on the left side,
not on the right. The grasp of both hands was diminished, slightly more so
on the left side. The biceps, triceps and wrist reflexes were absent on each side;
pressure over the course of the nerve trunks of both limbs caused pain; sensa-
tion to touch and pain appeared to be about normal over both extremi-
ties. Neither lower extremity showed any atrophy. Motion was greatly less-
ened on both sides, the patient being able only to bend the knee to a small an-
gle, and unable to raise the feet from the bed.

CASE III. W. M., age 64, white, a driver. He was admitted to the hospital
December 9, 1903. He had a negative family history. In 1865 the patient suf-
fered from malaria. He had drunk beer and whisky, mostly the latter, all his
life, and occasionally went on a spree.

Two months previous to his admission he went on a debauch, which lasted
about two weeks. Two weeks previous to his admission he was taken with
stinging pains in both feet, which rendered walking difficult; four days later
the pains appeared in his hands; about this time he also noticed marked wast-
ing of all his muscles, especially those of the lower extremities. He was then
so weak that he became unable to walk.

On admission the pains affected the lower limbs as high as the knees, and
the upper extremities to the elbows. There was no involvement of the cranial
nerves; neither did the viscera show any symptoms of consequence. All four
extremities evinced tenderness on pressure; the tenderness was shown espe-
cially in the hands and feet on lateral pressure. He had partial double wrist-
drop; all the muscles of the upper limbs showed weakness; slight ataxia was
also shown. Sensation to touch and pain was normal. The lower limbs were
markedly wasted. There was a tendency to foot-drop on each side. The
movements of both limbs were much weakened; patellar and Achilles tendon
jerks were both absent; Babinski and ankle clonus were not obtainable.

A carbuncle about four inches in diameter had formed at the right sacro-
iliac junction.

About two weeks after admission the patient showed signs of mental aber-
ration. The following is a general statement of his mental state for many
weeks, and a partial list of his many delusions, they being so numerous and
continuous that it would be impossible to record them all.

On the night of December 31st he called for his clothes, and after some time
attempted to leave his bed. The next morning he talked continuously of his
occupation, that of a farmer, stating that he had been to his home and seen
his relatives, his cattle and the rest of his effects. He was apparently much
worried about a certain team which he had for sale, and was not desirous of
keeping it through the winter. After a few minutes he called one of his at-
tendants, requesting him to remove a bottle from under his bed clothing; and
even though it was demonstrated that the patient's statement was false, he
still insisted that the bottle was there and that it was cold. On January 18th he
asked that a boy be sent to his home to get the wagon and harness; he re-
quested that a scamp should not be sent, for such a boy would run his wagon

on a pile of stones and upset it. A few days later the following train of words came from him: "Tell him I will not go down to work for him until I get better; I can work here just as well; I was not on the place; I would not tell a lie about it, neither would he; wasn't he in Florida? If you'll go up she will send one of the boys up. She is a woman of good common sense."

The following was noted two days later: "I slept in the wagon all day until four o'clock; they all know where I slept; as soon as I get home they will hear from my father every day. Did you see the 1¼-inch rails I put under my legs? I filled them half full with sand." When asked the kind of rails he had reference to, he said, "Iron rails."

He always recognized the interne when rounds were made. As a rule, he kept his head covered with the bed clothes. There were never any attacks of violence while in the hospital. At times he would pick at the bed clothes.

On February 3d his neuritis was progressively clearing up; the nerve trunks were gradually becoming less painful. Both grips were still very poor. His appetite was good, but wasting was marked.

At the date when the present notes were made (November 1, 1904), the patient was still in the hospital. He had steadily improved both physically and mentally, being on his feet and able to walk about by the middle of April. His mind slowly cleared up, and he was entirely free of delusions before he got on his feet.

At the time of the last notes he was perfectly rational; he had lost knee and Achilles jerks; some tenderness over nerve trunks of lower extremities; no wrist-drop or foot-drop. His feet were painful and tender. He complained of stiffness of the legs. There was still some weakness of all extremities; he had weak grips. His bowels and bladder were normal; he still had a moderate steppage gait.

REMARKS BY DR. MILLS.

For many years I have had frequent opportunities for observing cases of multiple neuritis. Most of these cases have been of alcoholic origin and most of them have come under my observation in the nervous wards of the Philadelphia Hospital. In not a few instances, however, I have seen cases of polyneuritis due to other causes, as, for example, to typhoid fever, influenza, rheumatism and tuberculosis. On one occasion I had the opportunity of seeing a small group of cases of beriberi brought into this country from one of the West India Islands. In consultation in private practice hardly a year has passed during the last twenty years in which I have not seen a few cases of this disorder.

While many of these cases have not presented any marked psychic symptoms, in a certain not inconsiderable percentage, mental disorder of some sort has been shown. As early as 1886 I directed attention to the concurrence of psychic symptoms with multiple neuritis. The following citation of an editorial note in the Journal of Mental Pathol-

ogy (Vol. IV, No. 4 and 5, 1903) calls attention to some of my earlier reported cases, but it will be understood that I make no claim to having in any way indicated the peculiar physico-psychic syndrome which Korsakoff* has made so clear and so interesting in his series of valuable publications on the subject, the first of which appeared in 1887.

"As early as 1886, a short time before the appearance of Korsakoff's first paper, at a meeting of the Philadelphia Neurological Society, in a discussion of a paper by Dr. E. C. Seguin on tropical beriberi, Dr. Mills called attention to the concurrence of spinal and cerebral symptoms in cases of multiple neuritis (Medical News, December 18, 1886). He spoke of these cases, probably in part incorrectly, as instances of the concurrence of myelitis and encephalitis with neuritis. Usually the cerebral condition in the so-called polyneuritic psychoses is a toxemia rather than an inflammation. In this communication reference was made to two cases seen in consultation. In one of these cases, a woman, the patient presented all the typical marks of multiple neuritis, and positive evidences of cerebral involvement in mental confusion with delusions and hallucinations of sight and hearing. In this case the history was clear, not only of alcoholism, but also of the use of opium, chloral and other narcotics. In another case, also seen in consultation, with a history of the use of tobacco and alcohol at intervals, and with a recent record of acute rheumatism and cardiac disease, the patient's sight had failed until he had scarcely more than the perception of light in both eyes, although ophthalmoscopic examination showed nothing abnormal. In eighteen months sight was recovered, chiefly through rest and hypodermatic use of strychnine. He had another rheumatic attack, associated with which was insomnia, cerebral irritation and severe brachial neuritis. Still later he had a transient attack of left hemiplegia, and later yet he was attacked with paralysis, anesthesia and pain and tenderness in both lower extremities, although the condition was much more marked on the left. He finally developed symptoms of marked cerebral implication, including total insomnia, refusal to take medicine, quasidelusions and great loquacity. He improved under rest, the use of morphine and other preparations of opium, digitalis and careful attention to diet. In a paper published in 1892 (In-

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* The earliest of Korsakoff's papers were as follows:

Disturbance of psychic function during alcoholic paralysis in relation to disturbed psyche with non-alcoholic polyneuritis. Vestnik psychiatrii nevropathologuii, t. iv., 2d series, 1887.

Korsakoff, Alcoholic paralysis. Dissertation, 1887, Moscow.

ternational Medical Magazine, February, 1892) on multiple neuritis and some of its complications, Dr. Mills refers to the psychical symptoms in several cases.   In one case of typical alcoholic polyneuritis in a middle-aged woman, the mental condition was one of dullness, forgetfulness and emotionality, with a tendency both to delirium and to somnolent attacks.   In another case, that of a young man with a history of alcoholic and other dissipation, the patient, after a debauch, had diplopia, unilateral ptosis, marked tremor of the hands and a staggering gait, with at first a little delirium of a motor kind, and some delusions of exaltation.   He had marked ataxia of both upper and lower extremities, associated with multiple neuritis, especially marked in the latter. Mentally he exhibited from time to time alternations of stuporous, apathetic and excited states, with a constant undercurrent of hallucinations and delusions; occasionally he showed a tendency to violence.   It may be noted in this connection that Dr. Mills pointed out (Medical News, V. 2, March 31, 1888) the concurrence of multiple neuritis in connection with epidemic cerebrospinal meningitis."

A study of the histories recorded by Dr. S. A. Carpenter for Dr. William G. Spiller and the writer will show that the symptoms exhibited bear out fairly well the views of Korsakoff and his disciples with regard to the peculiar characteristics of the polyneuritic psychosis which bears his name.   The three cases here recorded were studied by me personally many times, both as to their physical and mental symptoms. They were typical instances of alcoholic multiple neuritis; one of them (Case III) has largely recovered, but as the record indicates, still has some evidences of the disease in lost knee jerk and moderate steppage gait, although the physical symptoms have long since disappeared. The other two are at the time of writing (December, 1904) still in the hospital and in a condition which gives no assurance of eventual complete recovery.   It is just as probable that they will terminate fatally as that they will recover, and if recovery does result it will probably be only after many months, or, possibly, years.   In such cases, when recovery has taken place, the mental symptoms have disappeared first. In the first two cases above recorded the mental symptoms remained, vacillating as regards their intensity.

The peculiar form of amnesia which has been described under the name of pseudo-reminiscences or memory fabrications was well marked in two of these cases, as is illustrated by the details with regard to the delusional statements made by them.

While I believe that the polyneuritic psychosis is sufficiently charac-
teristic to entitle it to recognition as a special form of alcoholic disease,
it is true, as others have indicated, that the peculiar psychical symp-
toms associated with polyneuritis are sometimes observed in other af-
fections.   At this time, for example, there is in the men's nervous
wards of the Philadelphia Hospital a case of cerebro-spinal syphilis, as
indicated by the presence of a partial external and internal ophthalmo-
plegia with exalted reflexes, attacks of somnolence and other symp-
toms.   In this case the man has had at frequent intervals a state of
confusion, incoherence and amnesia.   His spontaneous statements and
the remarks which he makes in response to questions are typical in-
stances of pseudo-reminiscences.

The same form of amnesia has been observed in the psychoses, which
are sometimes associated with cerebral traumatisms and various infec-
tious and toxic diseases.

A CASE OF ACUTE POLIOMYELITIS OCCURRING IN AN ADULT.

Service of CHARLES S. POTTS, M. D.

Reported by JOHN W. FLATLEY, M. D., Resident Physician.

Acute poliomyelitis occurring in an adult is rare.

The combined statistics of Seeligmuller, Galbraith, Sinkler, Gowers and Starr show that the greatest number of cases occur in the second year of life; from that period there is a gradual decrease until the age of ten, when five cases are given. After this period no figures are given. Of the 214 cases collected by Gowers, the number in each successive year is as follows: First year, 54; second year, 58; third year, 39; fourth year, 17; fifth year, 23; sixth year, 8; seventh year, 4; eighth year, 6; ninth year, 5. On account of her age, therefore, the following case is deemed worthy of report:

A. S., a woman, 23 years old, married; occupation, housework, was admitted to the Philadelphia Hospital September 3, 1904. Her past medical history was negative, except that she had had two miscarriages, which were brought on by herself.

Her present illness dates back to May 16th, 1904, when she was suddenly taken with high fever, pains in back, headache and anorexia. One week later she suddenly lost power in both her lower limbs. Shortly after, severe pain in both legs was experienced, which was followed by contraction of the legs on the thighs, and the thighs on the abdomen; the skin was also hyperesthetic, so that the bed clothes increased her pain. Upon admission to the Philadelphia Hospital the following conditions were noted:

Sensation.—No areas of tenderness excepting slight hyperesthesia of the salves. No sensory paralysis.

Reflexes.—Knee jerks, Achilles jerks and Babinski reflex are absent. The patient lies with her feet in the position of equinus, and markedly everted. Marked hypotonia of the muscles, especially those about the hip joints, was present.

Paralysis.—No paralysis of the rectal and bladder sphincters. The muscles of the legs are very flaccid and atrophied, the quadriceps and tibialis anticus being especially so. No fibrillary tremors are present. The muscles of the legs and thighs do not respond to a strong faradic current. The feet are cold to the touch.

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The diagnosis of acute poliomyelitis as against multiple neuritis was made for the following reasons, viz.:

The sudden onset and development of paralysis, preceded by fever, backache, headache and anorexia. This is not the history of the commencement of multiple neuritis, which is progressive in its development. The marked pain and hyperæsthesia which existed in the early stages of the attack would seem to point toward neuritis, but it must also be remembered that pain and hyperæsthesia may occur in the early stages of acute poliomyelitis.

The contractures which also occurred at this time can be best explained by nerve root irritation, due to congestion of the meninges, a condition more or less present during the early stages of acute poliomyelitis.

TUBERCULOSIS OF THE SUPRARENAL GLANDS, WITH PULMONARY AND HEPATIC TUBERCULOSIS, GANGRENE OF THE RIGHT LUNG, HEMORRHAGE FROM THE BOWELS AND PARENCHYMATOUS NEPHRITIS.

Service of ROLAND G. CURTIN, M. D.

Reported by FRANCIS J. DEVER, M. D., Resident Physician.

Benjamin Savage, white, 58 years old, a laborer, was admitted to the hospital November 21, 1903. His chief complaints on admission were of cough, bloody expectoration, night sweats, loss of flesh and strength, and diarrhea.

His father and mother were dead from unknown causes; one sister and one brother had died of consumption. The patient had had pneumonia fifteen years ago. He has had winter cough each winter for several years. He does not remember having had any other disease. Has always been a hard drinker.

Six weeks ago the cough grew worse, and has persisted ever since. He has an expectoration, which is sometimes tinged with blood. He also has night sweats, and has lost much weight in the last six weeks, and at the present time he is very weak. He has a very bad diarrhea.

On admission, November 21, 1903, the following notes were taken: The patient was found to be an emaciated man, who laid constantly on his back, apparently without pain. He has marked arterial sclerosis. The pulse tension is high. He coughed at frequent intervals, but did not expectorate much. The cough was peculiarly weak in sound. The pupils were equally contracted and reacted well to light and to accommodation. The tongue was dry and brown, and was protruded feebly and with effort. The teeth were covered with sordes.

The chest was emaciated and the expansion was poor. The percussion note seemed rather hyper-resonant over the entire chest. The breath sounds had lost much of their vesicular quality on the left side, and expiration was here prolonged. Posteriorly the same held true except that at the angle of the scapula on the left side inspiratory rales were heard. The heart was normal in size and in position; the muscular sounds were fair; no murmurs were heard.

The abdomen was flaccid, and the skin here, as well as the skin over the rest of the body, was dry and harsh, and showed a brownish discoloration. No

pain or tenderness was present, and no tumor or mass was palpable. The liver was slightly enlarged downward and was not tender. No nodules were felt. The spleen was not palpable. The extremities were not edematous, but showed many brownish scars.

During the night of November 22, 1903, he passed about four ounces of blood from the rectum, and the next night, November 23, 1903, he had another hemorrhage from the bowel, the amount of blood lost being about six ounces. It was impossible to learn if the patient had had hemorrhages from the bowel previous to his admittance to the hospital. A rectal examination failed to reveal any hemorrhoids.

He had a moderate diarrhea, the stools numbering from two to five each day, and varied from a light brown to a dark brown in color. There did not seem to be any undigested food in the stools.

On November 25, 1903, he was put on supra-renal extract, grs. 3, four times a day, without any improvement. The following day the laboratory report showed that his sputum contained tubercle bacilli, leucocytes and a few micrococci. The urinalysis showed the urine to have a specific gravity of 1024. There was a faint trace of albumin, but no sugar. Microscopically there were found leucocytes, epithelium and hyaline casts.

An examination of the blood showed the hemoglobin to be sixty per cent. The red blood corpuscles numbered 3,670,000, while the white corpuscles numbered 8400.

It has been previously stated that the skin over his abdomen and over the rest of his body presented a brownish discoloration. This was very much more pronounced over those portions that were habitually exposed to the sun, as the back of the hands, the forearms and the back of the neck. On the body it seemed to be darker in color about the waist line. It was very pronounced on the upper and inner aspects of the thighs. These areas were triangular in shape, with the base upward, and formed by Poupart's ligament, the apex being in the middle third of the thigh on the internal surface. On the back there were areas of deeper brown pigment, generally mottled and irregular in size and shape. This brown mottling was most pronounced in the lumbar region. In this mottled area there were patches of vitelligo, very white, generally oval in shape, the largest measuring one-half by one-third inch.

A diagnosis of disease of adrenals, probably tubercular, was made.

On admission his temperature was 96 degrees; pulse, 112, and respiration, 36. Within two hours his temperature was 100 degrees; pulse, 114, and respiration, 38. For seven days thereafter his temperature varied from 97 to 100 degrees, and was irregular in type. The pulse varied from 80 to 114; the respirations varied from 24 to 40, but did not vary with the pulse; as, for instance, when his respirations were 40 his pulse was 84.

His temperature fell rather suddenly at the end of seven days, and remained subnormal, while the pulse varied from 80 to 100 per minute, and the respirations from 20 to 30. Four days before he died his temperature rose to 101 2-5 degrees. The next day it came down to normal, and the day he died, which was on December 14, 1903, his temperature was 96 degrees; pulse, 90, and respirations 42. From the time of admission the patient did not show any signs of improvement, and died gradually of exhaustion.

The following record was copied from the post-mortem book of the hospital:

Clinical Diagnosis.—Phthisis pulmonalis and tuberculosis of the adrenal glands. Pathological diagnosis.—Phthisis pulmonalis, with cavity formation of both lungs; gangrene of the right lung; chronic bilateral pleurisy; chronic aortic endocarditis; chronic perisplenitis; chronic parenchymatous nephritis; interstitial pancreatitis; tuberculosis of the right and left adrenals; miliary tuberculosis and chronic passive congestion of the liver; arterial sclerosis and atheroma of aorta and iliacs.

The body was that of a poorly nourished individual. Scaphoid abdomen. Skin very much darkened in color, especially over both forearms. Anterior surface of both legs showed numerous small round white scars. Peritoneum smooth and glistening. No adhesions. Appendix lying free. Lungs prominent. Left pleural cavity almost completely obliterated by many dense adhesions. Lower surface of lower lobe adherent throughout to the diaphragm. Right pleural cavity almost completely obliterated. Pericardium smooth and glistening, except that over the right ventricle there was an area of whitish thickening about two inches in circumference.

Heart was negative except that the aortic valves showed adhesions at the ends, and that there were plates of calcification in the leaflets. The openings of the coronary arteries showed numerous yellow slightly elevated patches.

The left lung, upper lobe, showed general infiltration by caseous material and numerous cavities about the size of hazel nuts, which were smooth and appeared to be enlarged bronchi. In them was found a greenish creamy pus. The lower lobe showed general caseous infiltration. The visceral pleura was much thickened.

Right lung.—This showed throughout a general caseous infiltration. The lower portion of the upper lobe showed an irregular cavity, in which was a thin bloody granular fluid with an offensive odor. The tissues in this area were a dark greenish-black color. The spleen was quite pale in color and firmly adherent on the superior surface to the diaphragm, the area of adhesions being shown by a dense thick whitish mass of apparently newly-formed connective tissue. The pulp was scanty.

Both supra-renals showed numerous small raised yellowish bodies scattered over the external surfaces, and in places extending within the body of the glands. The kidneys were unusually pale. The capsule stripped easily and in a few places were seen several small areas, yellowish in color, and about the size of pin heads. The cut surface showed the pyramids as well as the cortex to be pale and cloudy. The left kidney showed a hemorrhagic area about the size of a white bean, and also a small yellowish area about the size of a small pea. The ureters and bladder were normal. The stomach and rectum were normal. The pancreas was pale and firmer than normal.

The liver was slightly enlarged, darker in color than normal. Scattered throughout the surface and beneath its capsule were numerous yellowish areas about the size of pin heads and smaller. The cut surface showed numerous dark brown areas surrounded by areas pale and yellowish in color. The gall

bladder contained a slight amount of very much thickened and very dark bile. Adhesions connected it to the spleen.

The ascending portion of the arch of the aorta and also the abdominal aorta showed many irregular yellowish elevated areas. Both iliacs showed the same condition. There were no signs of any inflammation, congestion or ulceration of the intestinal canal at any point. A careful examination of the alimentary canal failed to give any clue to the source of the intestinal hemorrhage which occurred during life.

REPORT OF THE CHIEF RESIDENT PHYSICIAN.

By MONTGOMERY H. BIGGS, M. D.

Having been requested to submit a report upon the affairs of the Philadelphia Hospital since the publication of Volume V of the Hospital Reports, I will first chronicle changes in the Staff of Visiting Chiefs.

Dr. J. William White and Dr. John H. Brinton have been made consulting surgeons. Dr. John H. Musser resigned from the active staff and was made consulting physician. Other resignations were: Dr. John B. Shober, Dr. E. B. Gleason, Dr. Simon Flexner, Dr. J. P. Crozer Griffith, Dr. L. Napoleon Boston. Appointments to departments already existing: Dr. Judson Daland, Dr. Joseph Sailer, Dr. William L. Rodman, Dr. B. M. Anspach, Dr. J. Hendrie Lloyd, Dr. William Pickett, Dr. D. J. McCarthy, Dr. Walter Roberts, Dr. James H. McKee, Dr. Allen J. Smith, Dr. R. C. Rosenberger, and Dr. M. K. Kassabian.

In the latter months of 1904, two new departments were created; a Department for Tuberculosis, and a Genito-urinary Department. The staff appointed to the Department for Tuberculosis consists of Dr. Lawrence F. Flick, consultant, and Drs. Joseph Walsh, William B. Stanton, H. R. M. Landis and H. S. Anders, physicians. To the Genito-urinary staff were appointed Drs. Hilary M. Christian, E. H. Siter and Henry Tucker. It is with sincere regret that we record the death of our esteemed neurologist, Dr. F. Savary Pearce.

I would also report the death, in July, 1904, of Superintendent Robert H. Smith, who so conscientiously and capably filled various positions in the institution for over eighteen years. Always displaying an active interest in the affairs of the hospital department, his loss was keenly felt by all those associated with him in his work. He was succeeded in the superintendency by Mr. William F. Defrates.

We report with satisfaction the continuance and increase of clinical instruction. The hospital has participated in the movement toward increasing bedside and ward teaching, and our reports show in 1904 the largest recorded number of visits by students (27,216). The administration encourages the use of hospital material for medical instruction,

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and is endeavoring to render all possible assistance, at the same time bringing instructions within regulations which will safeguard the welfare of patients.

Realizing the exceptional value of histories and other records of patients we made early and continued effort to provide a system for the preservation, classification and indexing of records which would assure permanency and ready availability. With the assistance of some members of the staff a system was devised and put in operation in January, 1904, which we believe is not excelled by any large institution in the world, and which is being adopted by other hospitals. We take pride in claiming for the hospital originality and simplicity in this system, and can now demonstrate its thorough practicability. A full description can not be given in this report, but it may be said to provide for the grouping of cases of given diagnoses in vertical filing cabinets until a sufficient number have accumulated, when they are bound in substantial volumes. By this method, for instance, all records of cases of typhoid fever will be found in bound volumes on the shelves, or in one compartment of the cabinets. This will be appreciated by those who use the hospital records for statistical purposes. Any individual record can be immediately found by reference to either the name, chief filing or complication index card.

A treasured possession of the hospital is its library, which, while not consulted by the visiting staff to the same extent as in the earlier years of the hospital, has increased in numbers and intrinsic value. In 1904 there were added about one hundred volumes, and the same number or more will be purchased this year. A most useful adjunct is a branch library, placed in the Nurses' Home in 1904, which it is intended to enlarge each year. Efforts are being made to secure cabinets and cards in order to recatalogue the entire library in a modern way.

The appointment of internes by competitive examination in 1903 has been continued with success. Examinations are conducted by the Board of Civil Service Examiners; graduates of regular medical colleges in Philadelphia are eligible for examination in the year in which they graduate, and appointments and choice of service are made in accordance with the average attained in the examination.

One of the greatest practical and scientific needs of the hospital has been partially met by the establishment, in 1903, of a Clinical Laboratory. In that year a room, designated as a laboratory, but used almost exclusively for the examination of urine and sputum, was renovated and placed under the supervision of a Director of the Clinical Laboratory.

The work has constantly increased in quantity and scope, and four or more laboratory workers are occupied. During 1904 there were examined thirteen thousand five hundred and forty-two specimens. We feel that this department is still in its infancy, and hope to be able to provide for its rapid extension.

In 1903 a Director of the Roentgen-Ray Laboratory was appointed, additional equipment installed and this department is thoroughly well organized. We have just finished setting a new coil with complete equipment of the best pattern procurable, and an assistant in the laboratory has been appointed.

Much good has been accomplished by the creation of the Department for Tuberculosis. It has relieved the medical chiefs by reducing the excessive number of patients under their care; it minimizes the danger of contagion, and in their isolated buildings, under the care of a separate staff of eight physicians on duty throughout the year, the patients are surrounded by conditions more favorable to cure than have ever obtained in this hospital.

The organization of the Genito-urinary Department has also operated to the advantage of patient and chief.

Complete immunity to smallpox throughout the late epidemic was secured by vaccination of every patient admitted and every unprotected visitor, as well as the vaccination of all resident inmates in the institution each autumn.

Increased protection against fire was secured by weekly fire drill, placing a large number of canvas stretchers, and securing an appropriation for the erection of additional fire escapes and towers.

Employing our own force of mechanics, systematic renovation of wards and corridors was undertaken and has been pushed as rapidly as the demands of other departments permit. In nearly the entire main building repairs to plaster and woodwork have been made and the interior of the building painted; some rooms have been entirely torn out and rebuilt; new hardwood floors have been laid in the corridors and some of the wards; clothing and linen rooms have been erected; five new bath rooms have been built and modern plumbing placed. The wards have been reassigned so as to provide for such infectious diseases as pneumonia, typhoid fever, erysipelas and gonorrhœal ophthalmia. A cleaning and disinfecting force was organized.

An additional operating room has been built and equipped with all modern appliances and with instruments. The hospital kitchen has been doubled in size and many new utensils furnished. Ten new rooms have

been constructed and furnished in the Nurses' Home. The six new tubercular pavilions have been furnished and are occupied by ambulant cases, while another new building is used as a tubercular infirmary. Regulations require the removal of all patients having pulmonary tuberculosis to these buildings and segregation is thus accomplished. The straw mattresses and pillows formerly supplied have been replaced by those made of fibre. This permits disinfection and renovation, and gives comfort to the patients as well as a neat appearance to the beds. Six hundred and fifty of the old strap-iron beds have been replaced by new, modern high hospital beds, and four hundred steel bedside tables have been substituted for wooden ones. Numerous other articles of furniture and hospital appliances of steel and glass construction have been supplied, and many utensils of unsuitable type for hospital use have been replaced by others of appropriate material and design. The material for clothing hospital inmates has been changed, and in many instances the patients are allowed to wear their own clothing. All clothing worn by inmates when admitted is disinfected before being sent to lockers, and the bed and personal clothing of patients having infectious diseases is disinfected before going to the laundry.

Bleached muslin, white blankets and hospital spreads are being placed on hospital beds in increasing quantities. Insufficient laundry facilities, however, render it impossible to give to the bed and personal linen the neat appearance which is desired.

Because of the enormous size of the buildings and the numbers of articles required for an average of over twelve hundred patients, every branch of the modernizing process is slow in reaching completion, and, although a high degree of perfection is impossible until an entire new hospital is erected, we are constantly striving to put the internal equipment on a modern basis.

The greatest handicap to the work of the hospital is lack of a sufficient number of paid, responsible workers. We are dependent to such a large degree on inmate labor that it is impossible to approach the standard of service which we set, and many advances planned and attempted have to be abandoned because of an insufficient number of suitable and efficient persons to carry them out.

Unremitting energy on the part of the Superintendent has resulted in greatly improved conditions of grounds and buildings. Much has been done in the way of grading, sodding, laying cement and gravel walks, removing unnecessary fences, planting flowers, vines and trees, repainting and decorating the exterior of buildings, making tennis

courts, and opening up larger grounds and placing benches, etc., for the recreation of patients.

In the Training School for Nurses of the Philadelphia Hospital, I would report that Dr. Charles H. Frazier was appointed as a member of the Training School Committee to succeed Dr. Edward Martin, who resigned in 1904. Miss Margaret F. Donahoe succeeded Miss Marion E. Smith as Superintendent of Nurses, and Miss Grace Lippincott was appointed to succeed Miss Lydia Whiton as Assistant Superintendent of Nurses. Miss Lippincott resigned in April, 1904, and was succeeded by Miss Marie MacDonald.

During the two years sixty-one pupil nurses were accepted and sixty-one graduated, bringing the total number of graduates up to seven hundred and twenty-seven. Eleven of these sixty-one graduates occupy positions as Head Nurses in the Philadelphia Hospital, and several others have received similar positions in other hospitals. Since the Women's Venereal wards were transferred to the Gynecological service, the nursing has been done by pupils of the school. There is now under consideration a plan for organizing a separate department of the Training School for nursing in the Tubercular wards. It is proposed that the course shall be conducted on the eight-hour system and extend over a period of two years, and shall be open to women who have recovered from tubercular disease. The objects which it is hoped to accomplish are: Increased attention to tubercular patients; meeting the demand for nurses especially trained and skilled in the care of tuberculosis; a larger number of nurses in the general hospital, and furnishing to those who would otherwise be deprived, an opportunity to take up the nursing profession. Much benefit has been derived from the reference library, to which members of the staff contributed a number of volumes.

Five of our nurses were sent to Butler, Pa., in 1903, and remained throughout the epidemic of typhoid fever; and at the same time nine were detailed to the Municipal Hospital to assist in the care of smallpox cases.

Aside from the erection of an entire new hospital plant, some of the most pressing needs, in order to render better service, are: A larger number of nurses; trained orderlies; replacement of inmate employes now filling the more responsible positions by those skilled in hospital duties; modern bathrooms; a larger, modern laundry; additional hospital furniture, and a larger building for conducting autopsies and laboratory examinations.

MEMBERS OF THE MEDICAL BOARD

WITH ADDRESSES, PLACE AND TIME OF GRADUATION, DATE OF APPOINTMENT
TO THE PHILADELPHIA HOSPITAL, AND POSITIONS HELD
IN OTHER INSTITUTIONS.

In the main this list represents the order of seniority of the different members of the medical board; but in a few instances it does not, as some of the present members are serving for a second period. Some also have been elected during the same year, or even at the same meeting of the governing board, and practically the latter do not differ in seniority.

J. WILLIAM WHITE, M. D., 1810 South Rittenhouse Square. For many years Surgeon to the Hospital. Appointed Consulting Surgeon, 1904. John Rhea Barton Professor of Surgery in the University of Pennsylvania.

JOHN H. BRINTON, M. D., 1423 Spruce Street. Graduate of Jefferson Medical College, 1852. Appointed Consulting Surgeon, 1904. Professor of the Practice of Surgery and of Clinical Surgery in the Jefferson Medical College; Consulting Surgeon to the Southwestern Hospital and to St. Joseph's Hospital.

JOHN H. MUSSER, M. D., 1927 Chestnut Street. Graduate of the University of Pennsylvania, 1877. Appointed Visiting Physician, 1885. Professor of Clinical Medicine in the University of Pennsylvania; Physician to the University and Presbyterian Hospitals. Resigned from the Staff and appointed Consulting Physician, 1905.

LAWRENCE F. FLICK, M. D., 732 Pine Street. Graduate of Jefferson Medical College, 1879. Resident Physician at the Philadelphia Hospital from May, 1879, to May, 1880. Appointed Consulting Physician to the Department for Tuberculosis, 1904. Chief of Staff of the Henry Phipps Institute.

CHARLES K. MILLS, M. D., 1909 Chestnut Street. Graduate of University of Pennsylvania, 1869. Appointed, 1877. Clinical Professor of Nervous Diseases in the University of Pennsylvania.

ROLAND G. CURTIN, M. D., 22 South Eighteenth street. Graduate of University of Pennsylvania, 1866. Appointed, 1880. Consulting Physician to the Rush Hospital for Consumptives; Visiting Physician to the Presbyterian Hospital; Ex-President of the American Climatological Society.

W. JOSEPH HEARN, M. D., 1120 Walnut Street. Graduate of Jefferson Medical College, 1867. Appointed, 1882. Clinical Professor of Surgery in the Jefferson Medical College.

LEWIS W. STEINBACH, M. D., 1309 North Broad Street. Graduate of Jefferson Medical College, 1880. Appointed, 1885. Surgeon to the Jewish Hospital; Professor of Clinical and Operative Surgery in the Philadelphia Polyclinic.

HENRY W. STELWAGON, M. D., 223 South Seventeenth Street. Graduate of University of Pennsylvania, 1875. Appointed, 1887. Clinical Professor of Dermatology in the Jefferson Medical College, and in the Woman's Medical College; Physician to the Skin Department of the Howard Hospital.

FRANCIS X. DERCUM, M. D., 1719 Walnut Street. Graduate of University of Pennsylvania, 1877. Appointed, 1887. Clinical Professor of Neurology in the Jefferson Medical College; Visiting Physician to St. Clement's Hospital for Epileptics; Consulting Neurologist to St. Agnes's and the Jewish Hospitals, and to the State Asylum for Chronic Insane of Pennsylvania.

G. E. DE SCHWEINITZ, A. M., M. D., 1705 Walnut Street. Graduate of University of Pennsylvania, 1881. Appointed, 1887. Professor of Ophthalmology in the University of Pennsylvania; Ophthalmologist to the Orthopedic Hospital and Infirmary for Nervous Diseases; Consulting Ophthalmologist to the Philadelphia Polyclinic and College for Graduates in Medicine.

BARTON COOKE HIRST, M. D., 1821 Spruce Street. Graduate of University of Pennsylvania, 1883. Appointed, 1887. Professor of Obstetrics in the University of Pennsylvania; Gynecologist to the Orthopedic and Howard Hospitals.

FREDERICK P. HENRY, M. D., 1635 Locust Street. Graduate of College of Physicians and Surgeons, New York, 1868. Appointed, 1887. Professor of the Principles and Practice of Medicine in the Woman's Medical College of Pennsylvania.

EDWARD MARTIN, M. D., 1506 Locust Street. Graduate of University of Pennsylvania, 1883. Appointed, 1888; served until 1889; re-elected, 1892. Served as Surgical Registrar from 1885 to 1888. Clinical Professor of Surgery in the University of Pennsylvania; Surgeon to the Howard, St. Agnes's and Bryn Mawr Hospitals; Director of the Department of Health and Charities of Philadelphia.

EDWARD P. DAVIS, A. M., M. D., 250 South Twenty-first Street. Graduate of Rush Medical College, Chicago, 1882. Appointed, 1888. Professor of Obstetrics in the Jefferson Medical College; Professor of Obstetrics and Diseases of Infancy in the Philadelphia Polyclinic; Visiting Obstetrician to the Jefferson and Polyclinic Hospitals.

WILLIAM E. HUGHES, M. D., 3945 Chestnut Street. Graduate of the University of Pennsylvania, 1880. Appointed, 1889. Pathologist to the Presbyterian Hospital.

SOLOMON SOLIS-COHEN, M. D., 1525 Walnut Street. Graduate of Jefferson Medical College, 1883. Appointed, 1889. Senior Assistant Professor of Medicine in the Jefferson Medical College; Physician to the Jefferson Medical College Hospital, to the Jewish Hospital, and to the Rush Hospital.

ORVILLE HORWITZ, M. D., 1721 Walnut Street. Graduate of Jefferson Medical College, 1883. Appointed, 1889. Clinical Professor of Genito-Urinary Diseases, Jefferson Medical College; Consulting Surgeon to Jefferson Medical College Hospital; Surgeon to the State Hospital for the Insane.

ERNEST LA PLACE, M. D., 1828 South Rittenhouse Square. Graduate of University of Louisiana, 1884. Appointed, 1889. Professor of Clinical Surgery in the Medico-Chirurgical College.

GEORGE MORLEY MARSHALL, M. D., 1819 Spruce Street. Graduate of University of Pennsylvania, 1886. Appointed, 1890. Laryngologist of St. Joseph's Hospital and Chief of its Throat Dispensary.

JULIUS L. SALINGER, M. D., 1729 North Forty-second Street. Graduate of Jefferson Medical College, 1886. Appointed, 1892.

JOHN M. FISHER, M. D., 222 South Fifteenth Street. Graduate of Jefferson Medical College, 1884. Appointed, 1894. Assistant Professor of Gynecology, Jefferson Medical College; Assistant Gynecologist and Chief of the Department of Diseases of Women to the Jefferson Hospital; Gynecologist to the Phoenixville Hospital.

RICHARD C. NORRIS, M. D., 500 North Twentieth Street. Graduate of University of Pennsylvania, 1887. Appointed Registrar, 1890; Obstetrical Staff, 1894; Lecturer on Clinical and Operative Obstetrics, University of Pennsylvania; Physician in Charge, Preston Retreat; Gynecologist to Methodist-Episcopal Hospital; Consulting Obstetrician and Attending Gynecologist to the Southeastern Dispensary and Hospital for Women and Children.

THOMAS G. ASHTON, M. D., 1814 South Rittenhouse Square. Graduate of Jefferson Medical College, 1888. Appointed, 1894. Adjunct Professor of Medicine, University of Pennsylvania.

CHARLES A. OLIVER, M. D., 1507 Locust Street. Graduate of the University of Pennsylvania, 1876. Appointed, 1894. Attending Surgeon to the Wills Eye Hospital; Ophthalmic Surgeon to the Presbyterian Hospital, and to St. Timothy's Hospital.

J. CHALMERS DA COSTA, M. D., 2045 Walnut Street. Graduate of Jefferson Medical College, 1885. Appointed Registrar, 1890. Appointed on Surgical Staff, 1895. Professor of the Principles of Surgery and of Clinical Surgery, Jefferson Medical College; Surgeon to St. Joseph's Hospital.

AUGUSTUS A. ESHNER, M. D., 224 South Sixteenth Street. Graduate of Jefferson Medical College, 1888. Appointed Registrar, 1891, and Visiting Physician, 1896. Professor of Clinical Medicine in the Philadelphia Polyclinic; Assistant Physician to the Orthopedic Hospital and Infirmary for Nervous Diseases; Physician to the Hospital for Diseases of the Lungs, at Chestnut Hill.

ALFRED STENGEL, M. D., 1811 Spruce Street. Graduate of the University of Pennsylvania, 1889. Appointed Medical Registrar, 1892, and Visiting Physician, 1896. Physician to the University of Pennsylvania and to the Children's Hospital; Professor of Clinical Medicine in the University of Pennsylvania.

W. FRANK HAEHNLEN, M. D., Ph. D., 1616 Walnut Street. Graduate of the University of Pennsylvania, 1882. Appointed, 1895. Professor of Obstetrics, Medico-Chirurgical College; Obstetrician to Medico-Chirurgical and Maternity Hospitals.

ALFRED C. WOOD, M. D., 128 South Seventeenth Street. Graduate of the University of Pennsylvania, 1888. Appointed, 1895. Assistant Surgeon to the University Hospital; Demonstrator of Surgery in the University of Pennsylvania.

ELIZABETH L. PECK, M. D., 819 North Fortieth Street. Graduate of Woman's Medical College of Pennsylvania, 1885. Appointed, 1895. Visiting Physician, West Philadelphia Hospital for Women; Visiting Obstetrician to the Woman's Hospital.

CHARLES W. BURR, M. D., 1327 Spruce Street. Graduate of the University of Pennsylvania, 1886. Appointed, 1896. Professor of Mental Diseases in the University of Pennsylvania.

W. M. L. COPLIN, M. D., 1629 South Broad Street. Graduate of Jefferson Medical College, 1886. Appointed, 1892. Resigned, 1895. Reappointed, November, 1896. Professor of Pathology in the Jefferson Medical College.

CHARLES H. FRAZIER, M. D., 133 South Eighteenth Street. Graduate of University of Pennsylvania, 1892. Appointed, 1898. Professor of Clinical Surgery in the University of Pennsylvania; Surgeon to the University and Howard Hospitals; Surgeon to the Home for Crippled Children.

CHARLES L. LEONARD, M. D., 1930 Chestnut Street. Graduate of the University of Pennsylvania, 1889. Appointed, 1899.

H. AUGUSTUS WILSON, M. D., 1611 Spruce Street. Graduate of Jefferson Medical College, 1879. Appointed, January, 1900. Clinical Professor of Orthopedic Surgery, Jefferson Medical College; Emeritus Professor of Orthopedic Surgery, Philadelphia Polyclinic; Consulting Orthopedic Surgeon to the Kensington Hospital for Women; Consulting Orthopedic Surgeon, Philadelphia Lying-in Hospital.

HOWARD F. HANSELL, M. D., 1528 Walnut Street. Graduate of Jefferson Medical College, 1879. Appointed, March, 1900. Clinical Professor of Opthamology, Jefferson Medical College; Professor of Diseases of the Eye, Philadelphia Polyclinic and College for Graduates in Medicine; Ophthalmologist to the Chester County Hospital and to the Frederick Douglass Memorial.

HERMAN B. ALLYN, M. D., 501 South Forty-second Street. Graduate of the University of Pennsylvania, 1885. Appointed Medical Registrar, 1898, and Visiting Physician, June, 1900. Associate in Medicine in the University of Pennsylvania; Clinical Professor of Medicine, Woman's Medical College of Pennsylvania.

DAVID RIESMAN, M. D., 1624 Spruce Street. Graduate of the University of Pennsylvania, 1892. Appointed Visiting Physician, June, 1900. Professor of Clinical Medicine, Philadelphia Polyclinic; Associate in Medicine, University of Pennsylvania; Consulting Physician to the Jewish Hospital; Neurologist to the Northern Infirmary.

MILTON B. HARTZELL, M. D., 3644 Chestnut Street. Graduate of Jefferson Medical College, 1877. Appointed, July, 1900. Associate in Dermatology in the University of Pennsylvania.

E. S. GANS, M. D., 711 North Franklin Street. Graduate of Jefferson Medical College. Appointed, 1900. Lecturer on Dermatology in the Medico-Chirurgical College.

JOSEPH McFARLAND, M. D., 442 West Stafford Street, Germantown, Philadelphia. Graduate of the University of Pennsylvania, 1889. Appointed, October, 1900. Professor of Pathology and Bacteriology, Medico-Chirurgical College; Pathologist to Medico-Chirurgical Hospital.

WILLIAM G. SPILLER, M. D., 4409 Pine Street. Graduate of the University of Pennsylvania, 1892. Appointed, January, 1901. Assistant Clinical Professor of Nervous Diseases and Assistant Professor of Neuropathology in the University of Pennsylvania; Clinical Professor of Neurology in the Woman's Medical College of Pennsylvania; Professor of Neurology in the Philadelphia Polyclinic.

CHARLES S. POTTS, M. D., 1726 Chestnut Street. Graduate of the University of Pennsylvania, 1885. Appointed, January, 1901. Instructor of Nervous Diseases and Electro-therapeutics in the University of Pennsylvania; Assistant Neurologist to the University Hospital; Consulting Physician to the Hospital for the Insane of Atlantic County, New Jersey.

JOHN W. CROSKEY, M. D., 1831 Chestnut Street. Graduate of the Medico-Chirurgical College, 1889. Appointed, January, 1901.

CHARLES P. GRAYSON, M. D., 251 South Sixteenth Street. Graduate of Jefferson Medical College, 1880. Appointed, January, 1901. Clinical Professor of Laryngology and Rhinology, University Hospital.

JAMES P. MANN, M. D., 1234 Spring Garden Street. Graduate of Jefferson Medical College, 1887. Appointed, January, 1901.

GWILYM G. DAVIS, M. D., 225 South Sixteenth Street. Graduate of the University of Pennsylvania, 1879. Appointed, January, 1901. Associate Professor of Applied Anatomy in the University of Pennsylvania.

WILLIAM C. HOLLOPETER, M. D., 1428 North Broad Street. Graduate of the University of Pennsylvania, 1877. Appointed, January, 1901. Professor of Pediatrics, Medico-Chirurgical College; Pediatrician to the Medico-Chirurgical Hospital; Visiting Physician to the Methodist-Episcopal and to St. Joseph's Hospitals.

EDWARD E. GRAHAM, M. D., 1713 Spruce Street. Graduate of Jefferson Medical College, 1887. Appointed, January, 1901. Clinical Professor of Diseases of Children, Jefferson Medical College; Physician to the Franklin Reformatory Home.

J. MADISON TAYLOR, M. D., 1504 Pine Street. Graduate of the University of Pennsylvania, 1878. Appointed, January, 1901. Late Professor of Diseases of Children in the Philadelphia Polyclinic; Assistant Physician, Children's Hospital.

R. H. NONES, D. D. S., 1708 Chestnut Street. Graduate of Philadelphia Dental College, 1885. Appointed Dental Surgeon, January, 1901.

M. H. CRYER. D. D. S., 504 Crozer Building. Graduate of Philadelphia Dental College, 1876. Appointed Dental Surgeon, January, 1901.

I. NORMAN BROOMELL, D. D. S., 901 Crozer Building. Graduate of Pennsylvania College of Dental Surgery, 1879. Appointed Dental Surgeon, January, 1901. Professor of Dental Anatomy, Histology and Prosthetic Technics, Pennsylvania College of Dental Surgery.

THOMAS C. STELLWAGON, JR., D. D. S., 501 Hale Building. Graduate of Philadelphia Dental College, 1897. Appointed Dental Surgeon, January, 1901.

T. MELLOR TYSON, M. D., 1506 Spruce Street. Appointed, 1903. Visiting Physician to the Rush Hospital for the Treatment of Consumption and Allied Diseases; Assistant Physician to the Hospital of the University of Pennsylvania.

MIHRAN K. KASSABIAN, M. D., graduate of Medico-Chirurgical College, 1898. Appointed, 1903.

HENRY A. NEWBOLD, Ph. G., M. D., 3907 Walnut Street. Graduate of the University of Pennsylvania, 1893. Appointed Examiner for the Insane, 1901. Instructor in Pharmacy, University of Pennsylvania; Assistant Physician, Nervous Clinic, University Hospital; Assistant Physician, Nervous Clinic, Polyclinic Hospital.

R. C. ROSENBERGER, M. D., 2330 North Thirteenth Street. Graduate of Jefferson Medical College, 1894. Appointed 1903. Associate in Bacteriology, Jefferson Medical College; Bacteriologist to Jefferson Medical College Hospital; Pathologist to St. Joseph's Hospital.

JAMES HENDRIE LLOYD, M. D., 3918 Walnut Street. Graduate of the University of Pennsylvania, 1878. Appointed as Examiner for the Insane at Blockley in 1884, and Neurologist in 1887. Withdrew from the Hospital in 1889. Was reappointed in 1890. Resigned in 1900, and was reappointed in 1904. Physician to the Methodist-Episcopal Hospital; Consulting Neurologist to the State Hospital for the Chronic Insane at Wernersville, and to the Pennsylvania Training School for Feeble-Minded Children, at Elwyn, Pa.

ALLEN J. SMITH, M. D. Graduate of University of Pennsylvania, 1886. Appointed, 1904. Professor of Pathology in the University of Pennsylvania.

WALTER ROBERTS, M. D., 33 South Nineteenth Street. Graduate of the University of Pennsylvania, 1893. Appointed Assistant Laryngologist in 1903, and Laryngologist in 1904. Otologist to the Methodist-Episcopal Hospital, and Associate in Otology at the Polyclinic Hospital.

HILARY M. CHRISTIAN, M. D., 1344 Spruce Street. Graduate of the University of Pennsylvania, 1882. Appointed, December, 1904. Clinical Professor of Genito-Urinary Diseases in the Medico-Chirurgical College of Philadelphia; Professor of Genito-Urinary Surgery in the Philadelphia Polyclinic.

H. R. M. LANDIS, M. D., 130 South Twenty-third Street. Graduate of Jefferson Medical College, 1897. Appointed, December, 1904. Visiting Physician to the White Haven Sanitarium, and to the Henry Phipps Institute; Demonstrator of Clinical Medicine in the Jefferson Medical College.

HOWARD S. ANDERS, M. D., 1836 Wallace Street. Graduate of the University of Pennsylvania, 1890. Appointed, December 12, 1904. Assistant Professor of Physical Diagnosis, Medico-Chirurgical College of Philadelphia.

JAMES HERBERT McKEE, M. D., 1519 Poplar Street. Graduate of University of Pennsylvania, 1892. Appointed Registrar, 1901; Assistant Pediatrist, 1903; Pediatrist, October, 1904. Professor of Pediatrics, Philadelphia Polyclinic; Clinical Professor of Pediatrics, Woman's Medical College of Pennsylvania.

E. HOLLINGSWORTH SITER, M. D., 2038 Locust Street, Graduate of the University of Pennsylvania, 1897. Appointed, December, 1904. Instructor in Genito-Urinary Diseases in University of Pennsylvania, and Chief Surgeon to the Genito-Urinary Dispensary of the University Hospital.

JOSEPH WALSH, M. D., 732 Pine Street. Graduate of the University of Pennsylvania, 1895. Appointed, December, 1904. Visiting Physician to the White Haven Sanitarium of the Free Hospital for Poor Consumptives, and to the Henry Phipps Institute.

HENRY TUCKER, M. D., 119 South Twentieth Street. Graduate of Jefferson Medical College, 1894. Appointed, December, 1904. Genito-Urinary and Rectal Surgeon to the Henry Phipps Institute.

WILLIAM PICKETT, M. D., 124 South Eighteenth Street. Graduate of Jefferson Medical College, 1895. Appointed, December 30, 1904. Professor of Nervous and Mental Diseases, Medico-Chirurgical College of Philadelphia.

D. J. McCARTHY, M. D., 1329 Spruce Street. Graduate of the University of Pennsylvania, 1895. Appointed Registrar, 1902; Assistant Neurologist, 1904; Neurologist, 1905. Professor of Medical Jurisprudence, University of Pennsylvania; Neurologist to the Henry Phipps Institute; Visiting Physician to the Philadelphia Home for Incurables.

WILLIAM B. STANTON, M. D., 732 Pine Street. Graduate of the University of Pennsylvania, 1898. Appointed, January, 1905. Physician to the Henry Phipps Institute; Physician to the White Haven Sanitarium of the Free Hospital for Poor Consumptives.

BROOKE M. ANSPACH, M. D., 4813 Baltimore Avenue. Graduate of the University of Pennsylvania, 1897. Appointed, 1905. Instructor in Gynecology, University of Pennsylvania; Assistant Gynecologist to the University Hospital; Pathologist to the Kensington Hospital for Women.

JUDSON DALAND, M. D., 317 South Eighteenth Street. Appointed, 1905. Professor of Clinical Medicine in the Medico-Chirurgical College of Philadelphia.

WILLIAM L. RODMAN, M. D., 1904 Chestnut Street. Graduate of Jefferson Medical College, 1879. Appointed, 1905. Professor of the Principles of Surgery and Clinical Surgery in the Medico-Chirurgical College of Philadelphia.

JOSEPH SAILER, M. D., 248 South Twenty-first Street. Graduate of the University of Pennsylvania, 1891. Appointed Registrar, July, 1900; Physician, 1905. Associate in Medicine, University of Pennsylvania.

CARCINOMA OF SPINE AND MENINGES SECONDARY TO CANCER OF THE BREAST.*

F. SAVARY PEARCE, M.D.
Professor of Nervous and Mental Diseases, Medico-Chirurgical College,

AND

A. C. BUCKLEY, M.D.
Adjunct Professor of Histology, Medico-Chirurgical College.

PHILADELPHIA.

Ambulance History. Susan R. White, aged 70, housework, admitted to Philadelphia Hospital, Feb. 8, 1902. Duration of illness: four months; one month in bed. Symptoms: Pain in chest, pain in back, vomiting and diarrhea, severe pain over precordia and stomach, sharp pains in the leg at one time. She has had a lump in the breast for three years. Bowels and urine are not under her control. Both legs are paralyzed; anesthesia is present up to the waist line.

Hospital Record. (By Dr. Blayney, interne.) Chief complaint: Anesthesia and paralysis of the lower extremities.

Family History. One sister died of inflammation of the lungs (phthisis it is supposed); one sister died of scarlet fever; another of "cold"; one brother died of pneumonia.

Past Medical History. She had the ordinary diseases of childhood, and rheumatism.

Present Illness. Last November she was taken with pain in the hips; after the pains ceased the track of the pain would be very sore. The anesthesia and paralysis came on suddenly. She lost control of feces, then of urine. She lost control of feces before the

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paralysis came on. She had pains in the shoulder and back, had a creeping sensation in the left side which became better on pressure. She was sleepless for three weeks before entrance to hospital, and had the dry mouth of dyspepsia.

Physical Examination. Emaciated, aged white woman; chest emaciated; heart seems to have a systolic murmur; lungs resonant; liver and spleen apparently normal; pupils seem dilated, haze around edge of cornea; pulse soft, regular; tongue dry, with light-brown coat; extremities atrophied; knee-jerk absent in the left leg, present to a very slight extent in the right. Anesthesia exists to waist or slightly below umbilicus. She said she felt a pin stick her on the foot of right leg. She can move toes of right foot very slightly, those of left foot not at all. Plantar reflex is gone. She has incontinence of urine and feces, and has a sore over crest of ilium on the right side, also a sore over the sacrum. She has a nodule in left breast, and looks pale and emaciated.

February 21. Patient does not feel the prick of a pin on either sole of the foot, but does have occasional extension reaction. Knee-jerks are absent. Supra-orbital reflex is present. Pupils respond normally. Patient is very feeble and cachectic. Looseness of bowels exists, probably largely due to relaxation of sphincter ani muscle.

February 22. Patient is becoming more cachectic and growing weaker. There is a great tendency to decubitus where pressure is slightest. Does not feel when sole of foot is touched, but Babinski sign is present.

February 27. There is a great humping of the muscles of lower extremities at site of blister which was present on admission; over right ilium there is a large bedsore. Patient is very weak, and is taking very little nourishment.

Detailed History. (As taken by Dr. F. Savary Pearce.) The patient was always well up to last November (three months before admission), when she complained of pain and weakness in her legs, which came on gradually, and also of pain in her back; there was no history of any injury. She has been confined to bed since. For the last ten days she has suffered from nausea at times, retching and severe diarrhea. She has complained of pain radiating across the chest from one shoulder to the other; also of pain in the lumbar region, which she declares is constant. She has had no control of bowels or bladder for eleven days; she has not been sleeping well.

Examination. There is paralysis of lower portion of body; legs are flaccid; no sensation to touch, heat or pain from umbilicus down. Knee-jerks are absent on both sides, as are also the Babinski sign and ankle clonus. Pupils are slightly dilated, equal, react to light and accommodation. Tongue is protruded straight; no tremor; slightly coated. She has a hard nodular tumor in the left breast, upper and outer portion, for the last three years. It has not been growing rapidly lately; there is no pain unless she hurts it. She had a bedsore in sacral region on admission. Heart sounds are weak, slight accentuation of second sound; somewhat irregular. Arteries are atheromatous; arcus senilis. There was marked anterior curvature of spine beginning at ninth dorsal and extending to vertebra prominens; considerable tenderness over lowermost portion of curvature, but no true kyphosis or palpable tumor about the spine. Anesthesia posteriorly extends to a horizontal line just below the iliac crests, in front to a horizontal line apparently one-half inch above umbilicus. There is an ulcer in the right lower quadrant of abdomen just internal to anterior superior spine. Patient breathes well by diaphragm. There is a diffuse semicrepitant mass in the epigastric region extending from the umbilicus up three fingers' breadth and shading off in lateral region; it seems to be slightly movable and to move with respiration. The sensation of heat goes below that of sense of touch. She has had considerable pain in the past in the lumbar region. Tapping patellar tendon gives pain in the back. Atrophy of all extremities is symmetrical. There is a slight tendency to extension of toes.

Diagnosis. Compression myelitis or metastatic growth with compression. *Clinical Diagnosis.* Myelitis.

March 21. Patient had grown very weak, and toward the last refused all nourishment. Pain has been much less marked the last few days. She died this morning.

Autopsy. (Made by Prof. Joseph McFarland.) The woman was greatly emaciated. Pleural sacs contain very little fluid; cavities dry in appearance. Left pleura contains very strong adhesions and can only be separated with difficulty. Right contains only a few adhesions. On both pleuræ the parietal portions were dotted over with small tumors, from the size of a pea to one centimeter in diameter, these being far more numerous in right pleura, there being only two or three in the left side and the right containing eight or

ten. On section these were found to contain a semisolid cheesy material. These tumors did not involve the visceral pleuræ.

In left breast, about one and one-half inches to left of nipple, was a hard tumor about two inches in diameter. Skin strongly attached to tumor, but said tumor was freely movable over underlying tissues. On section tumor was found to cut with resistance, having a grating sensation; cut surfaces pale in color and very resistant to touch; skin strongly adherent to growth, being incorporated in its substance. (Saved for microscopic study.) The fourth and fifth ribs (left side) beneath site of tumor were softened, and on pressure a cheesy material would appear on their surfaces. (A portion of the fourth rib saved for further study.)

On section of vertebral column and removal of cord there was found in middorsal region a small portion of cord about 0.5 centimeter in length, which was softened in appearance and to the touch. Above and below this portion of the cord for some distance there were strong adhesions; also vertebræ in this region—four or six in number were softened in their bodies—a probe being readily thrust into them, showing distinct evidence of disease of the bones.

PATHOLOGIC FINDINGS (BY DR. A. C. BUCKLEY).

The interest, from a pathologic standpoint, centers about the spinal cord and its membranes. On gross examination there is to be seen on the anterior surface of the dura a mass of neoplasm about 5 mm. in thickness, extending from the tenth to the twelfth dorsal segments. The dura itself is considerably thickened. There can be seen clearly defined an ascending degeneration, limited to the postero-median columns, throughout the cervical region, and in the dorsal region as far as the eighth segment. At this level the lesion extends laterally, involving the postero-external columns, from which the gray substance can not be differentiated with the unaided eye. In the lower part of the tenth and the upper part of the eleventh dorsal segments there is an apparent diffuse myelitis. Below this there are distinct lateral lesions (descending degeneration).

The Neoplasm. The pathologic material, consisting of the primary breast tumor, a fragment of the fourth rib and the spinal cord, was prepared as follows: The tumor and the affected rib sections were stained with hematoxylin and eosin; the cord sections treated with hematoxylin-eosin, nigrosin and the Weigert-Pal

methods of staining. The sections from the primary growth show it to be of a pronounced scirrhotic type of carcinoma; indeed, in the part of the growth examined the connective tissue far exceeds the epithelium.

Sections made from the affected rib show the cancellated substance of the bone to be entirely replaced by a mass of carcinoma cells, which in many places have a distinctly alveolar arrangement, the epithelium approaching the columnar type. The compact portion of the bone is reduced to a mere shell. Where the bone has been reduced to small osseous islands, there are clusters of epithelial cells within the bone substance.

The neoplasm, in all probability, affected the rib by direct extension, since it occupied a position immediately beneath the primary tumor.

The pathology of the spinal cord closely resembles that of a similar case which I have reported and to the full description of which the reader is referred.[1]

Cervical Region of the Cord. In sections taken at the highest part of this region the changes are pronounced but not widespread. The pia is thickened; the anterior sulcal vessels thickened, though the intima appears normal. The trabeculæ formed by the pial extensions are much stouter than normal, and there is a general interstitial overgrowth in the entire cross-section of the cord. The nerve fibers in the white matter of the postero-median columns are distinctly degenerated, as is shown by the Weigert-Pal method of staining, the nerve fibers being replaced by a neurogliar overgrowth. The nerve roots are normal.

Lower in the cervical region (about the third segment) the amount of degeneration in Goll's column is greater than that in the above sections, and the nerve roots contain an interstitial overgrowth of fibrous tissue and round cells. Specimens stained with nigrosin show the axis cylinders to be intact in the nerve roots. The gray substance shows no distinct changes other than vascular dilatation and a slight round cell infiltration. The central canal is not patulous, being occupied by a mass of small round cells.

Dorsal Region. The lower segments contain the greatest amount of destruction; the tenth, eleventh and twelfth segments. The upper half of the eleventh segment contains very few normal nerve

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1. Jour. of Nerv. and Mental Dis., April, 1902.

fibers, there being practically a transverse myelitis. The membranes are thickened and the nerve roots degenerated to a greater or less degree, no doubt having been affected by the inflammatory process in the meninges. The muscular tunics of the blood vessels in the nerve roots appear to have undergone a hyaline degeneration, as they stain very faintly. Other vessels, such as the sulcal vessels, in the same sections stain well. On the anterior surface of the dura there is a mass of epithelioid cells, corresponding to the neoplasm mentioned above, which contains elements similar to those in the breast growth and the_affected rib. The cells are densely arranged in stout bands of fibrous tissue. In some areas there is a distinct alveolar arrangement.

The degenerative process affects chiefly the crossed pyramidal tracts in the lower half of the eleventh and in the twelfth segment. There is a marked vacuolation of the white matter and round cell infiltration. A slight interstitial overgrowth and increased vascularity are the changes in the gray substance in the dorsal part of the cord.

The position of the greatest amount of destruction to the cord substance is in the upper part of the eleventh segment, in which there are comparatively few normal nerve fibers in the entire cross-section. There are scattered patches in the lateral and posterior columns, in which the destructive process has progressed very rapidly, as is evidenced by the presence of masses of granular débris instead of the vacuolation and interstitial overgrowth described above.

Lumbar Region. It will be noted that following the transverse myelitis in the eleventh dorsal segment there was an ascending degeneration; likewise below the level of greatest destruction there follows, as usual, a descending degeneration. This in the lumbar region is not so marked as in the upper segments. In sections at the lumbar swelling the greatest change occurs in the nerve roots. The blood vessel in the fascicles are dilated and filled with blood. The majority of the nerve roots are the seat of an interstitial overgrowth varying in degrees, and much more marked on one side than on the other.

CONCLUSIONS.

We submit the following thoughts in concluding the study of this case of secondary carcinoma of spine and meninges, viz., the un-

doubted metastatic origin of the bony and meningeal growth from the tumor of the breast as shown by the alveolar arrangement of the cancer cells in all situations affected.

Secondly, from the necessarily imperfect clinical history (since the patient was apathetic and in extreme asthenia and cachexia when admitted to the hospital) it would seem that pain of root irritation of girdle type was the most prominent spinal symptom from the first, and was persistent.

Therefore, in the diagnosis of spinal meningeal growths, this case (with another of pedunculated spinal tumor already reported) would go in evidence that pain from the outset is an important sign of such secondary nervous invasion.

A CASE OF SOLITARY TUBERCLE OF THE PONS. REMARKS ON THE PATHWAY FOR SENSATIONS OF TASTE FROM THE ANTERIOR PORTION OF THE TONGUE.[1]

By CHARLES S. POTTS, M.D.,

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WITH PATHOLOGICAL REPORT AND REMARKS ON PALSY OF ASSOCIATED OCULAR MOVEMENTS.

By WILLIAM G. SPILLER, M.D.,

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(From the Philadelphia Hospital and the William Pepper Laboratory of Clinical Medicine, Phoebe A. Hearst Foundation.)

SUMMARY. A man, aged fifty-five years, with marked weakness of the right arm and leg; weakness of the muscles of the left side of the face, excepting the orbicularis palpebrarum ; of the muscles of mastication on the left side, fibrillary tremors of these muscles ; weakness of the left external rectus, with the loss of the power of associated movement of the eyes to the left, but with preservation of the power of convergence. Diminution of the power of appreciating touch, pain, heat, and cold on the right arm, leg, side of the trunk, neck, occipital region, and ear (Figs. 1, 3, and 4). On this side also were astereognosis and loss of the sense of position. Diminution of the power of recogniz-

[1] Read before the Philadelphia Neurological Society, October 27, 1903.

FIG. 2.
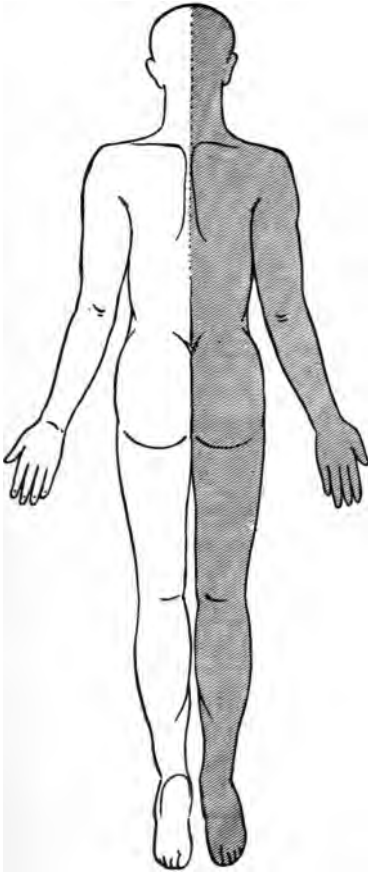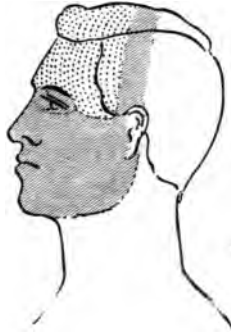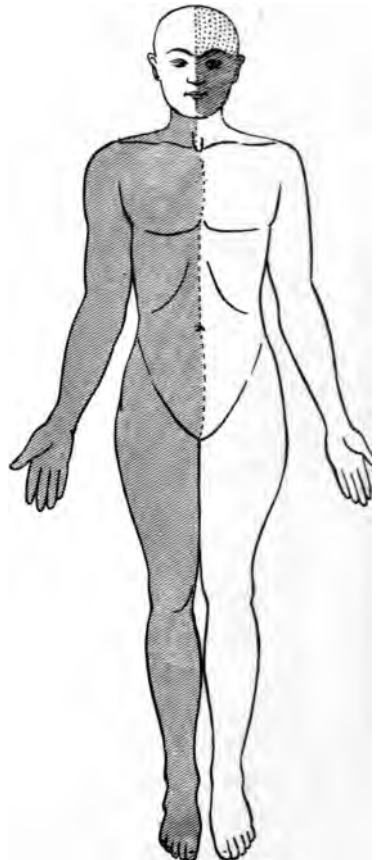
FIG. 1.   FIG. 4.   FIG. 3.

.... Nearly complete anæsthesia and analgesia and loss of temperature sense. The former mo[re]
marked than the latter.

\\\\ \\\\ Hypæsthesia and hypalgesia and impairment of temperature sense. These were more inten[se]
on the leg and back. There was also some difficulty in discriminting between heat and cold on the rig[ht]
side of the face.

ing touch, pain, and heat and cold on the left side of the face and head, as shown in Fig. 2. Slight loss of power of recognizing heat and cold on the right side of the face. Anæsthesia of the conjunctiva, mucous membrane of the nose, mouth, and tongue on the left side; also deafness in left ear and loss of sense of taste in the left anterior half of the tongue. Some ataxia of both legs, most marked in the right. A tuberculoma involving the left side of the pons found at the autopsy.

Gustav B., aged fifty-five years, by occupation a weaver; on July 11, 1902, was admitted to the nervous wards of the Philadelphia Hospital, complaining of "weakness of the right arm and leg and dizziness."

Family History. His father and mother had both died of "heart disease," and one of his sons had had tuberculous glands removed from the neck.

Previous History. He had had the diseases of childhood, malaria early in life, and typhoid fever at the age of sixteen years. Otherwise he had always been healthy. Tobacco and alcohol had been used moderately, and venereal disease was denied.

History of Present Illness. For the past two years he had suffered considerably from headache, but was not prevented from working. In December, 1901, he noticed numbness and tingling of the right arm and leg, the headache, principally on the left side, became constant and very severe. About this time also he began to see double. The right arm and leg gradually became weaker, and in January, 1902, he was obliged to cease work. He had never had any convulsive or spasmodic seizure, and never had been unconscious.

Examination. The patient was a tall, well-developed man, with a pallid complexion. Walking without support was impossible. When, with help, he did walk he at times dragged the right foot; at others he threw it forward with a jerk, resembling somewhat the gait of an ataxic. The left leg was also thrown forward in a jerky, ataxic manner, but not so markedly as the right. There was also difficulty in standing alone, which seemed partly to be due to weakness and partly to some degree of Romberg's symptom. When he smiled or made voluntary movements the angle of the mouth could not be drawn as well to the left

as to the right side, and the nasolabial fold was not so well marked upon the left side as upon the right. Weakness of the upper part of the face was not present.

Both eyes could be opened and closed normally. The pupils were unequal, the left being the smaller; both responded sluggishly to light and better in accommodation. Lateral nystagmus was present in both eyes when the patient looked either to the right or to the left. There was inability to look to the left with the left eye, also inability to make associated movement of both eyes to the left. Convergence was well performed, but not quite so well with the right eye as with the left. All other movements of both eyes could be well performed. Owing to circumstances beyond our control the fundus was not examined. His eyesight, however, was fair. On the left side contractions of either the masseter or temporal muscles could not be felt. The pterygoids on that side were also weak, as the point of the chin could be drawn better to the left than to the right. The tongue was protruded straight, could be moved well in all directions, and showed no evidences of atrophy. All movements of both arms could be performed; on the right side they were distinctly weaker than those of the left, which were of good strength, and those of the distal part were more affected than the proximal. All movements of both legs could also be performed, but were much weaker on the right than on the left side. The loss of power seemed to be greater in the leg than in the arm. There was no rigidity of the limbs; the muscles were flaccid, but not atrophied. Fibrillary tremors were noticed in the masseter and muscles about the angle of the mouth of the left side, especially when attempts were made to use them. Jaw-jerk was absent. The tendon jerks of the arms were present on both sides, but were much more active on the right. The cremaster reflex was not present on either side. The abdominal was absent on the right side and present on the left side. The knee-jerk was increased on the right, normal on the left side; a similar condition maintained for the Achilles jerk. Ankle clonus was absent. The plantar reflex was present on both sides; on the right a well-marked Babinski phenomenon was present; on the left it was absent, the toes being flexed.

His speech was thick and rather indistinct; there was no evidence of aphasia.

Sensory paralysis was present, as indicated in Figs. 1 to 4. The line of demarcation was not quite so sharp as indicated in the diagrams. In addition, the conjunctiva and mucous membrane of the mouth and nose on the left side were anæsthetic. As has been said, his vision seemed to be fair, and hemianopsia was not present. On the right side the tick of the watch was heard at four inches; on the left at contact. Tests were not made to determine if deafness was due to nerve or middle-ear trouble. On the right side there was inability to appreciate when passive movements of the fingers and toes were made and to recognize positions in which they were placed. Owing to the restricted movements of the arm and leg of this side it could not be determined if there was ataxia of these limbs. Astereognosis was present on the right side. No trophic symptoms were present, and, with the exception of cold feet, none of the vasomotor symptoms. The heart, lungs, kidneys, and other viscera were practically normal. A diagnosis of tumor involving the left side of the pons was made.

On August 18th it was noted that the patient complained of coldness of the feet, particularly on the right side. Dribbling of saliva from the left side of the mouth and some weakness of the muscles of the upper part of the face (occipitofrontalis and corrugator supercilii) on this side were noted, but the eyelids could still be tightly closed.

On August 22d he left the hospital at his own request.

After returning to his home it was ascertained that his headache increased in severity; he became more helpless, his eyesight failed, and in the latter part of September he committed suicide by hanging.

The brain was removed by Dr. W. G. Spiller.

The fact that the sense of taste was affected only on the anterior portion of the left side of the tongue would seem to bear witness to the view that taste sensations from this portion of the tongue reach the brain by way of the fifth nerve and not by the glossopharyngeal. If the latter idea is true it is hard to explain why

taste was not also lost in the posterior portion. It must also be borne in mind that none of the other functions of the ninth nerve were affected.

McConnell and Bundy[1] have reported a case of tumor of the pons in which there was loss of taste sense on one side of the tongue both anteriorly and posteriorly. As there was no paralysis of the muscles supplied by the ninth nerve they held that this nerve was not damaged and that their case was an argument in favor of the fifth nerve being a conductor of sensations of taste. Mills[2] in discussing this case explains this away by saying that "It was more likely that the gustatory pathway from the glosso-pharyngeal nuclei through the pons to the higher regions was implicated, the probable course of this tract being in the lateral or superior mesal fillet." While this, in the absence of autopsy, may serve as a hypothetical explanation of McConnell and Bundy's case, in which the entire one side of the tongue was involved, it does not explain why in the present case the anterior portion of the tongue was affected and not the posterior. In our case the fillet on the left side was completely destroyed, yet as there was hypæsthesia and not complete anæsthesia on the right side of the body, some sensory impressions must have reached the cortex from that side, presumably by means of the right fillet. Probably, also, in the same way sensations of taste from the posterior portion of the tongue reached the cortex in the way mentioned by Mills, and quoted above. If the nerve of taste for the anterior portion of the tongue is also the glossopharyngeal, it seems reasonable to suppose that sensations from this portion of the tongue should have reached the cortex by the same path, which, as a matter of fact, they did not. The fifth nerve, however, was found to be much degenerated; in fact, the sensory loss was more profound in the distribution of this nerve (Figs. 1 and 3) than anywhere else, and it seems reasonable to suppose that the involvement of the fibres of this nerve was responsible for the loss of taste in the anterior portion of the tongue.

The non-involvement of the occipitofrontalis and corrugator

[1] Annals of Ophthalmology and Otology, 1896, vol. v.
[2] Nervous Diseases, p. 702.

supercilii until some time after the muscles supplied by the lower facial were affected, and the escape of the orbicularis palpebrarum from any degree of paralysis, is of interest. It might be explained, as has been done recently by Jacoby,[1] that the upper facial is especially resistant to pathological influences, and in this connection it is a significant fact that the fibres of the facial were not directly involved, but were merely subjected to pressure. A better explanation, however, would seem to be a decussation of certain fibres of the facial after they have left their nucleus, these fibres being those which go to supply those muscles which habitually act together, as those supplied by the upper facial do. The fact that the left posterior longitudinal fasciculus was involved in our case certainly tends to disprove the belief, formerly much taught, that the nuclear origin of the fibres which supply the orbicularis palpebrarum is in the nucleus of the third nerve, and that by way of this tract they join the fibres of the seventh nerve after the latter have left the facial nucleus.

REMARKS BY DR. WILLIAM G. SPILLER.

We were permitted to retain only the pons for microscopic examination.

The left side of the pons was much larger than the right. In its upper part, just above the entrance of the fifth nerve, a tumor was found occupying the left half of the tegmentum and invading a little the pyramidal tract on the same side. The right half of the pons was not implicated. In the lower part of the pons the tumor implicated the left middle cerebellar peduncle and the pyramidal fibres on the left side, but did not invade the dorsal part of the tegmentum. The right side of the pons was not encroached upon by the tumor at any part. The nucleus of the sixth and probably that of the seventh nerve escaped, but the fibres of these nerves within the pons must have been compressed by the tumor. The left posterior longitudinal bundle was directly invaded in its upper part by the tumor. The tumor was

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[1] Journal of Nervous and Mental Disease, October, 1903, p. 589.

much harder than the surrounding brain tissue, and microscopic examination showed it to be a tubercle.

The left third nerve, stained by the Marchi method or teased and stained by a 1 per cent. osmic acid solution, was normal.

The left fifth nerve, teased and stained by a 1 per cent. osmic acid solution, showed much degeneration of nerve fibres. The degeneration was not so evident in sections stained by acid fuchsin.

The left sixth nerve appeared to be slightly degenerated by the Marchi method, but not by acid fuchsin.

The left seventh nerve was degenerated, as shown by the Marchi stain. Some infiltration of the nerve by cells with small round nuclei was also found.

The left temporal muscle was slightly atrophied.

One symptom especially has been to me of great interest in this case. I refer to the paralysis of lateral conjugate movement of the eyeballs toward the left. The man was unable to look toward the left with either eye, but the inward movement of the right eyeball in convergence was good—i. e., the contraction of the right internal rectus was preserved when it was not associated with contraction of the left external rectus. This phenomenon was observed by both Dr. Potts and me.

In the interesting case of double paralysis of the lateral conjugate movement of the eyes reported by Alexander Bruce,[1] with necropsy, a small, tuberculous tumor was found in the upper and posterior part of the pons. It occupied the position of the two abducens nuclei, the facial nerves, and the posterior longitudinal fasciculi, but did not reach the fillet.

Bruce believes that the view suggested by Foville, in 1858, that the abducens nuclei are the lower centres for the lateral conjugate deviation of the eyes, has been firmly established by a sufficient number of experimental and of combined clinical and pathological observations, but that the exact path by which each abducens nucleus controls the opposite internal rectus has not as yet been completely demonstrated. He says, further, that there is a fairly general consensus of opinion that the fibres which form the first part of this path, after leaving the abducens nucleus

[1] Review of Neurology and Psychiatry. May. 1906. p. 323.

ascend within the posterior longitudinal fasciculus, but that there is no such agreement as to whether they enter directly into the third nerve and pass by it to the internal rectus, or whether they terminate in the nucleus of the third nerve. If the latter view be correct, it is not determined whether these fibres end in the third nucleus of the same side, or whether they cross over to the nucleus of the opposite side ; and if they do pass over to the other side, whether they do so at the level of the abducens, or of the oculomotor nucleus, or at some intermediate point.

Bruce cites Van Gehuchten and Held as maintaining that the posterior longitudinal fasciculus is composed entirely of descending fibres, derived, according to the former, from the " nucleus of the posterior longitudinal fasciculus," and, according to Held, from the anterior corpora quadrigemina. This opinion of Van Gehuchten and of Held, Bruce regards as erroneous, basing his statement on the study of his own case and the investigations of others, but he thinks it has not yet been demonstrated that any of the ascending fibres of the posterior longitudinal fasciculus arise in the sixth nucleus. Assuming that such fibres exist, Bruce believes that the cases of Wernicke and Long and his own demonstrate that these nerve fibres do not pass directly into the third nerve, and that the connection of the abducens nucleus with the opposite oculomotor nerve must be indirect. The point of decussation of these fibres to the oculomotor nucleus of the opposite side is uncertain, but Bruce thinks it is clear that the crossing takes place considerably above the level of the sixth nucleus. This opinion our case supports, as the sixth nuclei could not have been implicated in the tumor, judging from a study of the macroscopic sections.

Raymond and Cestan[1] have reported several cases of paralysis of conjugate movement of the eyeballs, with necropsy. In their most recently published case the paralysis was double, but more marked in the attempt to look to the right. The power of convergence was good. A large tubercle was found in the tegmentum of the pons. The nuclei of the third and sixth nerves were normal, and the trunks of the third and sixth nerves were not de-

[1] Revue Neurologique, January 30, 1901, p. 70, and June 30, 1903, p. 644.

generated. They believe that this case demonstrates that paralysis of lateral associated movement of the eyeballs may result from a lesion not implicating the nuclei of the third and sixth nerves, but from an internuclear lesion. As no degeneration was found in the third nerve, their case is further evidence that nerve fibres do not pass directly from the sixth nucleus into the third nerve. In 1901 they reported two very similar cases, with necropsy, in each of which a tubercle of the tegmentum of the pons was found.

A. v. Kornilow[1] has been able to obtain references to a number of cases of paralysis of associated ocular movement, and he concludes that paralysis of lateral conjugate movement is the result of a lesion in or near the nucleus of the third nerve. This seems to be a well-established opinion, and it is hardly necessary to refer to other reported cases.

In the case that we report the paralysis of lateral associated ocular movement was probably caused by the lesion above the nucleus of the left sixth nerve ; but as the posterior longitudinal fasciculus was implicated in the tumor in the middle and upper part of the pons, the case was not a suitable one for determining where the decussation of nerve fibres in this fasciculus took place, although it is probable that the decussation did not occur near the sixth nucleus.

The symptoms in this case, as shown by Dr. Potts, indicated that a lesion of the left side of the pons existed, and the presence of the paralysis of lateral conjugate movement of the eyeballs toward the left permitted us to make an almost certain diagnosis of a growth implicating the left half of the tegmentum of the pons, and removed all doubt as to the existence of a tumor upon the surface of the pons. The diagnosis of the location was exactly correct. As tubercle has been found in a number of similar cases, the tumor was believed to be a tubercle before the necropsy was made.

I think it well to emphasize the importance of the paralysis of lateral associated movement of the eyeballs in clinical diagnosis. In such a case as the one described in this paper there might be

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[1] Deutsche Zeitschrift f. Nervenheilkunde, Bd. xxiii., Nos. 5 and 6, p. 417.

doubt whether the symptoms were caused by a tumor on the pons or by a tumor within the pons. As we have been trying for some time to remove by operation a tumor upon the pons or in the cerebellopontile angle, it is evident that if we could find a clinical sign indicating that the tumor were intrapontile we should consider operation inadvisable when this sign was present. Such a sign, I believe, we have in the paralysis of lateral conjugate movement of the eyeballs, and I should be unwilling to recommend operation for removal of a pontile tumor if this form of ocular paralysis were present ; its absence, however, is no proof that the pons is not invaded, but merely that the posterior longitudinal fasciculus is intact.

THE DIFFERENTIAL DIAGNOSIS OF SINGLE OR MULTIPLE BRAIN TUMORS AND DIFFUSE ENCEPHALIC SYPHILIS.

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The study of the differential diagnosis of tumor from multiple or diffuse syphilis of the brain has received a new impetus by the revival of interest in the surgery of brain tumors which has taken place in the last five or six years, and has for its chief reasons a more advanced and more exact knowledge of cerebral localization and greatly improved methods of surgical procedure. It is more particularly with regard to cases in which the question of operation is paramount that the considerations of this paper apply.

Within about a year, in addition to the two cases reported in detail in this paper, I have been confronted with at least half a dozen cases in which either operation or autopsy, or both, have demonstrated the difficulties of making an absolute diagnosis between intracranial syphilis and encephalic tumor. One of these proved to be a case of large isolated prefrontal sarcoma; the second a case of multiple sarcomatosis; a third one of sarcoma of the motor region; a fourth sarcoma of one lateral lobe of the cerebellum; a fifth a cerebellopontile fibroma with associated hydrocephalus, and still others were a carcinoma of the chiasm and a basal cyst, with possibly other lesions unrevealed. In three or four cases during the same time the diagnosis remained uncertain in spite of the fact that operation was performed, the lesion in all of these cases being presumably subcortical.

Tumors at the base have in the past usually been regarded as inoperable; but as this is not absolutely true, as, for instance,

it is not impossible to reach and remove a pediculated cerebello-pontile growth, even in the case of symptoms pointing to basal lesion, the question of operation may occasionally have to be considered in connection with that of the differentiation of diffuse syphilis from brain neoplasms. For another reason in similar cases the question of operation may need to be considered, namely, because it is possible to relieve the severe head pain in cases of brain tumor by opening the skull, or as suggested by Dr. Frazier and the writer, to bring about the same result by section of the fifth nerve.

In the two cases following the question of the existence of a brain tumor or tumors, probably associated with other lesions, was one which in certain periods of the history of the cases required careful consideration. The cases, however, in the light of the autopsies show that close adherence to the principles of localization and a recognition of several points of particular interest in connection with the diagnosis of diffuse cerebrospinal syphilis were all that were needed to avoid mistake.

S. R., white, single, aged twenty-seven years, boxmaker, was admitted to the nervous wards of the Philadelphia Hospital, October 20, 1902. He was a user of both alcohol and tobacco, and one year before his admission had contracted syphilis, for which he received treatment lasting six weeks. When the patient was admitted he was in a somewhat dazed state, answering incoherently. He was evidently suffering with headache. Two or three days after his admission his sister visited the hospital and stated that he was well until two years before, when, while at his work, he was struck on the left side of his head with a pole, which did not, however, render him unconscious, but for several months afterward he could not work, complained of pain in his head and a dimness of vision, for which he was treated at an eye hospital. He returned to work, but was compelled to quit again, and later was admitted to the venereal wards of the Philadelphia Hospital, where he remained for a time which was not determined. One week before his admission to the nervous wards he began to act strangely at home, talking incoherently, but not attempting any violence. He complained of headache and marked numbness in both legs, and could not walk without assistance.

He had had several attacks of vomiting. The left eye showed external strabismus, becoming more marked from day to day. The sister also stated that the patient had never had epileptic seizures.

During the first two days after admission it was noted that both pupils were dilated equally, the iritic reflexes were lost; apparently complete loss of power in the left internal rectus, the eye moving sluggishly in all directions. The left eyelid drooped. The patient complained of a dull pain in the left eye, which seemed to bulge. The facial muscles and tongue showed no loss of power. The same was true of both the upper and lower extremities, which were not paralyzed. Sensation was normal everywhere. The biceps and triceps jerks were lost in each arm. The knee-jerks were exaggerated on both sides; ankle clonus was not present; the Babinski response was elicited on the right but not on the left side. He suffered with dull headache, which was paroxysmal; pressure on the head caused no pain. Toward the close of an attack of headache the patient says that his eyes became affected and that he saw double. He denied having fallen or injured his head, although this was in contradiction to the statement of his sister as taken later and given above. As already indicated, as the patient was at times incoherent reliance could not be placed upon his statements. The patient had no symptoms referable to other parts of the body than the nervous system.

On October 26th, about six days after admission, an examination was made, with the following results: the patient stated that he occasionally was dizzy; he described the dizziness as a whirling-around sensation. He did not show any unusual degree of somnolence at this time. He replied correctly or apparently correctly to questions, but the resident physician believed that his statements were not always reliable. Examination showed no pain on pressure in the distribution of the fifth nerve on either side, and no loss of the sense of pain or touch on either side. Apparently he could smell well on both sides, but persisted in saying that he could smell better on the left. Hearing was good on both sides. He was tested with sugar and salt, but his replies were evidently unreliable. He could draw up the right side of his mouth fairly well, better than the left, but he wrinkled the

forehead equally on both sides. The masseters contracted equally on both sides, and the tongue was protruded in the median line. Resistance to passive movements and voluntary movements were normal in the extremities; examination for all forms of sensation, including the sense of position, showed nothing abnormal in any part of the body. The tendon phenomena were exaggerated in the lower extremities, but more on the right. The Babinski response was absent on both sides, the toes not being very distinctly moved on either side. Ankle clonus was sligthly indicated on the right, and still more feebly on the left. The tendon reflexes in the upper extremities were slightly exaggerated on each side.

A careful examination of the pupils and of the ocular movements was made. The left pupil was much dilated, the right normal; the reaction to light in both the left and right eye seemed to be entirely absent. There was probably a very feeble contraction of the left iris in accommodation; the left eye could not converge because of paralysis of the internal rectus; the response, both to accommodation and convergence, was feeble in the right eye. The visual fields, roughly tested, were about normal.

The following report of Dr. de Schweinitz was made on October 27th. Right eye: moderate neuritis with perivasculitis; left eye: optic neuritis a little more marked than on the right. Left oculo-motor palsy; internal rectus and inferior rectus most affected; ptosis not complete. Fields not taken.

The patient insidiously changed for the worse; examinations were made from time to time, but were recorded only on November 24, 1902, and December 15, 1902.

On November 24, 1902, it was noted that the Babinski response was very marked on both sides, and that partial loss of power in the left arm and leg was very apparent; that the right pupil was much dilated and failed to respond to either light or distance; also that there was complete inability to draw up the left corner of the mouth. The conditions were those of partial left hemiplegia with left oculomotor paralysis.

Examination of the urine showed nothing abnormal. The interne, Dr. Holmes, made a résumé of his temperature, as follows: The temperature was normal from the time of admission

until the evening of November 22d, when it arose to 101.1° F., and then fell to normal. On the evening of November 28th it rose to 100° and again fell to normal. On the evening of December 1st it rose to 100°, and on December 2d to 101°, again falling to normal. On December 15th it rose to 102°, and on the evening of the same day it rose to 102.3°, varying thereafter from 102.3° to 105.1° just before death.

Examination made December 15, 1902, gave the following results: Stupor was very marked; the patient did not reply to questions; breathing was stertorous; there was a constant up-and-down movement of small amplitude of each eyeball, more marked on the right while the patient was being examined; occasionally the movement of the eyeball was lateral. The pupils were about equal and dilated; the right eyeball deviated slightly to the right, the left looked directly forward. Sensation was retained. It was impossible to test by command any movement of the external ocular muscles, face or tongue. When the left arm was raised and allowed to drop it fell as if paralyzed.

The ward nurse stated that the patient had not moved any of his limbs for four weeks, and that he was able to take only liquid food. The upper limbs were somewhat flaccid. The left lower limb fell as if paralyzed, the right lower limb had more tonicity. The triceps, biceps, and wrist reflexes were all a little exaggerated, more so on the left. Knee-jerks were slightly exaggerated on both sides; ankle clonus was absent on both sides; the Achilles reflex was present on both sides, but more distinct on the left; the Babinski response was very distinct on both sides, the great toe and one or two adjoining toes being distinctly moved upward quickly.

Dr. G. E. Pfahler made an x-ray investigation of the head, and reported that the examination showed an abnormal shadow, about one inch in diameter, at the base of the brain, lying in front of the petrous portion of the temporal bone, and nearer the left side than the right. The autopsy, as will be seen later, failed to corroborate this report.

The autopsy showed the body of a large-sized male, poorly nourished. Several scars were present on the inner and outer sides of both legs, above and below the knees. Rigor mortis was well

marked. The scalp showed a moderate amount of œdema, chiefly in the occipital region. A small scar was present over the frontal region. The brain was generally œdematous ("wet brain"). Careful examination of the membranes and external brain revealed no gross lesions excepting a cystic condition of the pituitary body.

The report of the microscopical examination of the brain by Dr. William G. Spiller is as follows: An area of softening is found in the head of the right caudate nucleus and anterior limb of the internal capsule. Section from the paracentral lobule stained by the hæmatoxylin and acid fuchsin show a moderate round-cell infiltration of the pia. The capillaries of the cortex are very numerous, and are much distended with blood. Many of the cells of Betz by the thionin method appear much degenerated, the cell body has lost its usual form, and some cells are entirely free from chromophilic elements. Sections of the right optic nerve show a very intense round-cell infiltration of the pia and to a less extent between the nerve fibres. Sections of this optic nerve stained by the Weigert hæmatoxylin method do not appear degenerated. Sections of the right third nerve show a pronounced round-cell infiltration in the pia about the nerve and also within the nerve between the nerve fibres. Some of the axis cylinders are a little swollen. By the Weigert hæmatoxylin method the third nerve appears slightly degenerated. Sections of the left third nerve show intense round-cell infiltration within the nerve, great congestion of the bloodvessels, and this nerve is more degenerated than the right third nerve. Sections from the cervical region of the spinal cord show much round-cell infiltration of the pia and a moderate infiltration within the cord. The pyramidal tracts are not degenerated by the Weigert hæmatoxylin method. The nerve cells of the anterior horns stain well by the thionin method and appear to be very little diseased.

In this case the symptoms and signs which made it necessary to consider the diagnosis of brain tumor in the first place were such general manifestations as headache with paroxysmal exacerbations, vertigo, mental change, and double optic neuritis, and on the focal side oculomotor paralysis and left hemiparesis increasing to hemiplegia in the extremities. The x-ray investigation seemed also to point to a tumor at the base. A close study of the

case, however, shows that some of the symptoms indicated bilateral and not improbably spinal disease. Besides the well-marked left third nerve paralysis and left hemiparesis of the face and limb, with corresponding reflexes, the patient at different stages exhibited such phenomena as the Babinski response and ankle clonus on the right; later the Babinski reaction on both sides, and loss of iritic reflexes. The same tumor could not have caused the third-nerve paralysis, deepening into hemiplegia of the same side, as a growth so located as to involve the third nerve would have been so placed above the decussations as to affect the face and limbs on the opposite side. The Babinski response and exaggerated tendon jerks on the left may have been attributable to the same lesion that caused the hemiparesis, or to a certain extent the exaggerated reflexes on both sides may have had some dependence on the meningomyelitic cervical and basal lesions.

The occurrence of the left hemiparesis in association with marked cranial-nerve symptoms, the former not being due to a lesion at the base but to a softening of the internal capsule as shown by the autopsy, indicates one of the sources of error in the differential diagnosis of diffuse cerebral or cerebrospinal syphilis from brain tumor. Widespread disease of bloodvessels is so often associated with syphilitic lesions involving the membranes and substance of the brain and cord that in such a case, softening, the result of vascular occlusion—this being due to some form of syphilitic arteritis—may be present in almost any part of the cerebrospinal axis. Tumor, or at least isolated tumor, should be excluded in any such case when the symptoms are not only bilateral but clearly point to lesions originating at different times and in different parts of the encephalon.

For the next case I am indebted to Dr. Spiller, in whose service at the Philadelphia Hospital the patient was studied.

The patient was referred to Dr. Spiller from the service of Dr. Stengel in the Philadelphia Hospital. He came to the Philadelphia Hospital from St. Joseph's Hospital, where he had been admitted May 27, 1903. About six weeks before his admission to St. Joseph's Hospital he began to have headache, which was

most marked across the forehead and occasionally extended toward the temples and back of the head. This was followed in about four weeks by dimness of vision, which continued to grow worse.

After admission to the nervous wards of the Philadelphia Hospital he was first seen on June 28, 1903, by Dr. T. H. Weisenburg, who examined and recorded the case in detail. The patient was a man of about middle age, and worked in a machine shop. He had started drinking when about eighteen years old. He denied venereal disease. The patient was well until about three months before admission, when he began to complain of frontal headache, which gradually grew worse, and about one month later he developed dizziness, which had since been always present. One evening, about two months before admission, while bending over, he fell, struck his head, and was unconscious for about six minutes. His eye-sight had continuously failed, as above stated, until at the time of the examination, he said he could not see at all.

He had nausea and vomiting, the latter giving him much relief. He said that he had convulsions in the arms and legs, but his mental condition was such that he could not tell whether the spasms were limited to certain parts.

The patient lay with his mouth open, his eyelids almost closed, and a dull stupid expression on his face. He responded to questions fairly well, but he said his memory was becoming poor. He said also that he was able to walk until about one month before, when he became unable to do so on account of dizziness. In walking he staggered, the inclination being more toward the right. The dynamometer showed the grip in the left hand to be 20, in the right hand 52, the normal average being about 150 for the left and about 200 for the right. Resistance to passive movement in the right upper limb was normal, in the left a little below normal. Both upper limbs were uniformly wasted, but there was no local atrophy. Resistance to passive movement in the lower limbs was better on the left; voluntary movements were performed fairly well; both lower limbs were flaccid at the knees and ankles. The biceps, triceps, and wrist reflexes in the right upper extremity were absent, in the left they were greatly diminished. The knee-jerks and Achilles jerks were absent on both sides. On

reinforcement the quadriceps on the left seemed to contract on one examination, but not on others. Plantar irritation produced flexion of all the toes on the right and flexion of the small toes and extension of the great toe on the left.

Sensation to pain and touch was normal all over the body, and the sense of position was not lost in any of the extremities; stereognostic perception was not lost in either hand. Some ataxia was present in both upper limbs, being more marked in the left. The tongue protruded slightly toward the left and showed coarse tremor, but not atrophy. The masseters contracted firmly on each side; the nasolabial fold on the right was deeper than on the left, and in showing the teeth the left corner of the mouth was not brought up as well as the right; he could not close his eyelids on the left as well as on the right, and in looking upward the left eyebrow did not wrinkle. Both eyes were bulging, the pupils seemed to be equal. Hearing seemed to be normal on both sides. There was no incontinence of urine or feces.

Dr. H. F. Hansell, one of the ophthalmologists to the hospital, examined the patient's eyes, June 29, 1903, and reported almost total ophthalmoplegia with ptosis, more complete on the right side, and the puplis equal and responsive; the eyes were slightly divergent, the right more than the left; in both eyes large swelling of the disks, with hemorrhages, was present. On June 29th Dr. Spiller examined the patient, with the following results: His answers were relevant, but he made mistakes, as, for instance, four plus eight equals nine. He said, " I have not had anything to eat or drink this morning; I have not had anything to eat since yesterday morning, and nothing to drink since yesterday afternoon." These answers and statements indicated his impaired mental condition. The whole left side of the face was paralyzed, including the upper distribution of the seventh nerve. He could close the left eyelid, but not as firmly as the right, and the left upper lid could be raised without resistance when he attempted to squeeze the eyelids together. The tongue was protruded nearly straight, deviating a little toward the left. He did not attempt to brush away flies from his face. Both eyeballs protruded, especially the right; the right external rectus was paralyzed, and the left internal rectus was very weak; he was unable to move

either eyeball to the left beyond the median line. Upward and downward movement of each eyeball was impaired, but he could look downward with the right much better than with the left. Ptosis was present on both sides and about equally marked. The movement of the iris to light was slight, if present at all, on each side. Convergence and accommodation could not be tested for reaction of the iris, as the muscles of convergence were paralyzed and the man was completely blind.

Hearing was exceedingly impaired on the right side for the watch tick, and much impaired on the left. There was sordes on the teeth.

He moved the upper limbs freely in all directions. The dynamometer marked 4 for the right hand and 20 for the left hand. The tendon reflexes in both upper and lower limbs were abolished. The small muscles of the left hand were more wasted than those of the right, but not exceedingly so. Sensation to touch and pain was normal in all parts of the body. The sense of position was normal. Voluntary power in the lower limbs was fairly well preserved. The Babinski reflex was not distinct on either side. When sitting he swayed greatly from side to side, and when standing he was extremely ataxic, and would have fallen if not supported. On attempting to walk he moved his limbs with great inco-ordination. Hemiasynergia was present on the right side and not on the left. He said that he was more comfortable when lying on his back, and that he suffered with dizziness and pain when lying on his left side; when lying on his right side he had pain, but no dizziness.

The man gradually grew worse, and died July 6, 1903.

Numerous areas of inflammation were found extending from the gray matter into the white matter of the brain. An examination of one of these areas of softening shows an intense round-cell infiltration about the bloodvessels and within the tissues. Sections from the left and right optic nerves show the same intense round-cell infiltration. The right oculomotor nerve is not degenerated, even by the Marchi method. Swollen axis cylinders are found in the right fourth nerve, but the Marchi method reveals no degeneration of the myelin. The left fourth nerve appears to be normal. The left seventh nerve shows no degeneration by the

Marchi method. Sections from the medulla oblongata show intense round-cell infiltration about the bloodvessels of the pia and within the pia. The Marchi method shows no recent degeneration of the anterior pyramids. Sections from the cervical cord present the same intense round-cell infiltration about the bloodvessels of the pia and within the pia. Some small recent hemorrhages are found in the gray matter. Some of the nerve cells of the anterior horns stained by acid fuchsin are degenerated. The crossed pyramidal tracts are not degenerated by the acid fuchsin or Weigert hæmatoxylon stains.

The chief features of this case may be summarized as follows : A man aged about forty-five years, three months before his death began to suffer with headache, which became very severe and was soon accompanied by dizziness, nausea, and vomiting. His sight gradually failed until he became blind, the examination showing double choked disk and consecutive atrophy. He had complete left facial paralysis, bilateral ophthalmoplegia, external and internal, not quite complete, loss of hearing more marked on the right side, inco-ordination of station and gait, hemiasynergia on the right, abolished tendon reflexes in both upper and lower extremities, uncertain plantar reflexes, and mental weakness. Sensation was unaffected. In this case, as in the preceding, the general symptoms and some of the focal symptoms seem to point to tumor of the base, possibly in the cerebellopontile angle; but this diagnosis could not explain the ophthalmoplegia present on both sides and such confusing symptoms as right hemiasynergia and right-sided deafness, with complete left facial paralysis.

What symptoms are of most importance in the diagnosis of an isolated tumor? In my experience, if the signs and symptoms of encephalic disease present can be referred to a single location in the brain, the chances are against cerebral syphilis, although this is a rule not without exceptions. If the patient, for instance, presents a symptom-complex clearly indicative of disease of the motor region, of the cerebral area for the muscular sense and stereognostic perception, of the cortical or subcortical visual regions, of one cerebellar hemisphere, or of the cerebellopontile angle without indications of the involvement of any other portion of the brain or of the spinal cord, and without the history of

previous symptoms or syndromes pointing to implication of other parts, a non-syphilitic lesion may usually be diagnosticated. Even the apparent exceptions to this rule, if carefully studied, will prove not to be as real as they seem at first sight. In one of my cases, for instance, in which operation verified the correctness of the focal diagnosis, the symptoms pointed clearly to a lesion involving the motor area of the left hemisphere. At the time of operation scarcely any other symptoms were present, and yet the patient had double ankle clonus, and, what was more important, he had a previous history of an attack of hemiparesis which seemed referable to the now apparently unaffected cerebral hemisphere. The case was one of pachymeningitis and gumma adherent to agglutinated membranes. It was, indeed, a tumor or mass, but even in this case indications of more or less diffuse lesion were present. It was, I believe, a proper case for operation supplemented by active and continuous antisyphilitic treatment.

In exceptional cases the symptom-complex may point to separate regions of the brain, and yet the tumor may be single and not a syphilitic lesion.

Large tumors of the cerebrum not reaching to the basal surface, and more particularly tumors of the parietal lobe, may sometimes give cranial nerve symptoms, as, for instance, paresis or paralysis of one sixth nerve, and hypæsthesia in the domain of the fifth nerve, symptoms which were present in a case seen by me several times in consultation, the case having been placed on record by Drs. Dercum and Keen (*Journal of Nervous and Mental Disease*, December, 1903). The tumor in this case was firm and of enormous size, weighing over half a pound, and doubtless exerted much downward pressure. I have seen several other cases in which a tumor, presumably parietal, or demonstrated to be such by operation or autopsy, has caused either fifth, sixth, or seventh nerve symptoms apparently by pressure. If operation is decided upon in a case of this kind the proper procedure would always be to first make an exploratory parietal opening. Such cases are very commonly regarded as illustrations of multiple syphilitic lesions.

Another explanation of large parietal lesions with disturbances

of eye movements and limited areas of hypæsthesia is to be found in the probable involvement by pressure or invasion of a visual motor region connected with the visual occipital region, and the implication of areas of the cortex concerned with the representation of cutaneous sensibility of particular portions of the body.

With regard to general symptomatology, it might be said that the so-called general symptoms of brain tumor, namely, headache, vomiting, vertigo, optic neuritis, and mental disturbances, are usually present at some time and in some degree in cases of diffuse intracranial syphilis. Any one or two of them may, however, be absent; but this is also true of tumor cases. Headache may be present in both, but, if anything, is more frequent and more severe in neoplasms, although occasionally showing itself with great severity in diffuse cerebral syphilis. Exactly the same remark might be made about optic neuritis. Vertigo and vomiting may be present in both, but, owing to the fact that some tumors, and especially fibromata and sarcomata, have a special tendency to attack the eighth nerve, which includes both the cochlear and vestibular nerves with their auditory and equilibratory functions, in some cases of tumor the vertigo assumes a peculiar and particularly severe type.

The mental disturbances in diffuse cerebral syphilis are not usually significant of any particular localization of lesions, but rather of the existence of a general syphilemia. I believe it is now possible, by a close study of the mental symptoms in a case of brain tumor, especially when the neoplasm is situated in the left cerebral hemisphere, to locate the tumor in the prefrontal or higher psychical region, or in the parieto-occipito temporal region (the concrete concept area of the writer, the posterior association area of Flechsig). Of course, in the latter case other symptoms like verbal blindness or deafness and concept aphasia may be of prime value in the diagnosis, but other affections of concrete memory, like mind blindness or mind deafness, disorientation, or amusia may be used with advantage. It follows that with a sufficiently close and elaborate investigation an isolated tumor may be located by a study either of its somatic or psychical symptoms, or both. In diffuse cerebral syphilis psychical symptoms are often present, but they are not commonly of a decisive

stain. Many of these nerve cells are much shrivelled and have lost their dendritic processes. Some are merely small masses of pale-yellow granular matter, with only a trace here and there of chromophilic elements. In some places the cells are so diseased that they appear as mere shadows. The alteration of the nerve cells of the anterior horns is as intense in the cervical region as in the lumbar.

There is no evidence of myelitis or meningitis. The blood-vessels of the cord and pia are not diseased, and there is no round-cell infiltration. The direct and crossed pyramidal tracts are not in the least degenerated. Notwithstanding the intense alter-ation in the cells of the anterior horns, the anterior roots appear to be very little affected, as shown by the acid fuchsin stain. No degeneration of the spinal cord is shown by the Marchi method. A piece of nerve removed from one of the limbs, and probably from the distal portion, as it has been customary to take a nerve from the distal portion of the limbs, shows considerable degeneration by the Weigert hæmatoxylin and acid fuchsin stains. A piece of muscle that was probably removed from one of the thenar eminences or the sole of the foot is intensely atrophied, and the small nerve fibres contained within these sections of muscle are much degenerated, as shown by the Weigert hæmatox-ylin stain. A piece of the same muscle stained by the Marchi ·method shows no recent degeneration.

The clinical picture presented by this case—viz., the partial paralysis of the upper and the total paralysis of the lower ex-tremities, the implication of the sphincters, the great emaciation, the contractures of the limbs, the great tenderness to pressure along the spinal column, the extreme pain and tenderness, even at the slightest pressure over any part of the limbs, and the history of possible cancer of the stomach—was typically that of para-plegia dolorosa, and the diagnosis of vertebral carcinoma was made.

The microscopic examination revealed the findings of a chronic multiple neuritis. We do not see how it would have been pos-sible, even reviewing the case in the light of the pathological findings, to have made a correct diagnosis during the life of the patient with such a symptom-complex as that detailed.

A very interesting point in the history of Case I. was the bulbar involvement. The notes read : " The muscles of the face are extremely atrophied; the lips are very thin; the tongue is atrophied on each side and is protruded very slightly beyond the line of the teeth. There are no fibrillary tremors of the face or tongue. The fifth and seventh nerves are normal." There is no note made of the character of the speech or of the ability to swallow, but the patient was in such a serious condition that the examination could not be complete, and opportunity was not given to examine her a second time. It is probable that the atrophy of the face was part of the general extreme emaciation, but the involvement of the tongue was distinctly pathological.

Bruns[1] records a similar case of vertebral carcinomatosis where there were distinct bulbar symptoms. These consisted of a right-sided atrophy and paralysis of the tongue, right-sided paralysis of the soft palate, difficulty in swallowing, increase of the pulse rate, and occasional vomiting. The atrophy and paralysis of the tongue became bilateral. The macroscopic examination gave no explanation of the bulbar symptoms. We have been unable to find another similar case.

In 1897 Schlesinger[2] called attention to the fact that in diseases causing contraction of space in the uppermost part of the spinal canal, especially tumors, the clinical symptoms may be ushered in by bulbar phenomena. He reports a case in which the disease began with sudden bulbar manifestations, followed by spinal symptoms. At the autopsy a solitary tubercle in the uppermost cervical cord was found. A careful microscopic examination of the bulb revealed nothing to explain the condition, and Schlesinger therefore concludes that through circulatory disturbances in the neighborhood of the tumor, possibly through transitory œdema in the region of the nuclei, the bulbar symptoms might be explained.

Nonne[3] records a case of intramedullary ascending sarcoma in which, as soon as the lesion approached the cervical cord, bulbar symptoms became manifest. Microscopic examination did not

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[1] Archiv f. Psych. u. Nerven., vol. xxxi. p. 162.
[2] Deutsche Zeitschr. f. klin. Med., vol. xxxii., sup. heft, p. 98.
[3] Archiv f. Psych. u. Nervenheil., 1900, vol. xxxiii. p. 410.

physician must simply use his judgment with regard to the value of the history given by the patient, or in rare cases by the friends or relatives of the patient. A frank acknowledgment of syphilis and the cicatricial evidences of a primary sore are, of course, usually convincing, yet even in these cases the possibility of a sarcoma or other tumor occurring in one who has had syphilis must not be overlooked. I have seen several instances of this.

My experience teaches that on the whole but little reliance can be placed upon the therapeutic test in the differentiation of single or multiple tumors of the brain from diffuse intracranial syphilis. Active antisyphilitic treatment is, of course, of value in recent cases of meningitis, or even of meningoencephalitis; it may do something to halt or to hold in abeyance some of the forms of arteritis, but it is practically useless after fibroid changes have taken place in meningitis, or after softening from occlusion or cell or tract degenerations has occurred. The only possible good that mercury and the iodides can do in such cases is to prevent additional new deposits or new changes, the result of the continuing toxic action of the syphilitic virus. It would seem probable from experience that, after considerable secondary changes have taken place, the effects of antisyphilitic remedies on recent specific lesions are less positive than before the advent of such alterations. I am led to make these remarks by recalling many unsuccessful and some sad experiences with the so-called therapeutic test. In every case referred to in the beginning paragraphs of this paper, as covering a portion of my experience during about a year past, antisyphilitic remedies were vigorously applied, and in almost every case with, what seemed to the onlookers, some temporary success. The patient saw a little better out of one eye or heard a little better with one ear, was a little steadier on his feet, or had a little less headache or fewer spells of vertigo, nausea, or vomiting, so that the remedy was continued from day to day and from week to week, but in every case the story was the same, namely, the recurrence of both general and focal symptoms with greater severity and increasing amplitude. Perhaps this would matter little if it were not for the fact that through trying such treatment too long operation is postponed until it becomes useless. The torturing headache

continues, and, what is the most serious of all, the optic neuritis increases until atrophy begins to appear and blindness is inevitable. When it is remembered that the course of optic neuritis may be stayed by opening the skull, and that headache occasionally disappears entirely after trephining, even when the tumor is not removed, the importance of not dallying too long with anti-syphilitic remedies will be recognized. Another fact should be borne in mind, one which was pointed out long ago by the late Dr. E. C. Seguin, and has since been adverted to by many others, namely, that nonsyphilitic tumors, and especially sarcoma, are sometimes temporarily improved by the use of iodides and mercury, and especially the former. The improvement, however, is always transient, but is sufficiently marked in some cases to deceive the therapeutist into the idea that the test has proved his diagnosis of syphilis.

One of the most difficult problems of diagnosis is that presented by the differentiation of diffuse or disseminated cerebral or cerebrospinal syphilis from multiple sarcomatosis, a difficulty which has been recognized by some and has been experienced by the writer. One case observed by me is recorded in a paper by Spiller and Hendrickson (*American Journal of the Medical Sciences*, July, 1903) on multiple sarcomatosis. The patient, first seen by me in private practice, was afterward admitted to the University Hospital, first under my own care, and later under that of Dr. Spiller. I made a careful study of his symptoms a number of times. He died after several weeks of observation at the hospital. The case is described in detail by Spiller, but a few diagnostic points are worthy of special emphasis. The entire symptomatology of the case extended over a period of only about one year preceding the death of the patient. It began with headache, which augmented in intensity and frequency of occurrence, and at times was of great severity. Failing sight was another very early symptom. Six months after the onset of headache and failing sight the patient began to have difficulty in walking, and would sometimes become dizzy and fall. He had also attacks of vomiting. He had two convulsive seizures without unconsciousness. Examination for hearing showed apparently total labyrinthine deafness on the right, and on the other

side a scarcely less marked loss of hearing. Choked disk had been present on both sides, and on one had passed into atrophy, and the external straight muscles on both sides were paralyzed. Basal syphilis with a gumma in the left cerebellopontile angle was suspected, although the diagnosis of a non-syphilitic tumor or tumors was considered most probable. The autopsy showed a remarkable condition of multiple sarcomatosis. A growth was present in each cerebellopontile angle, others involved the Gasserian ganglia of both sides, and the pituitary body; still others were present in the fourth ventricle, in the right external auditory meatus, and right jugular foramen, and numerous small sarcomata were scattered about the pia and nerve roots of the brain and cord. Nonne (*Deutsche Ztschr. f. Nervenheilk.*, vol. xxi., Nos. 5 and 6; *Arch. f. Psychiat.*, vol. xxxiii.) has called attention to the difficulties of diagnosis between acute cerebrospinal syphilis and multiple sarcomatosis as illustrated in one of his recorded cases.

A comparison and contrast of the two cases given in this paper and the case cited from Spiller and Hendrickson will probably afford as good points of differentiation of the two affections as can be obtained, but close analysis of the three cases shows that the difficulties are almost insuperable. Rapidity of the course of the disease has been suggested as of some value in favor of the diagnosis of sarcomatosis, and yet in the first of the cases of diffuse cerebral syphilis mentioned in this communication the symptoms were of less than a year in duration, and in the second case the first active symptom noted—headache—came on only three months before death.

In both cerebral or cerebrospinal syphilis and in multiple sarcomatosis of the central nervous system, symptoms indicating involvement of the cranial nerves at the base are usually prominent, as they were in the cases referred to in this paper. If any difference could be determined in this respect in these cases it was that in the syphilitic cases the ophthalmoplegias were more complete than in the case of sarcomatosis, and yet in other cases of basal specific disease, as is well known, the cranial-nerve symptoms may vary greatly in extent and may appear and disappear in whole or in part. This tendency to disappearance and

reappearance of nerve symptoms in syphilitic cases is not, so far as I know, observed in multiple sarcomatosis. In this, affection the lesions as found in autopsy are usually much more extensive than the symptoms during life indicated, owing to the resistance of nerve roots and nerve substance to sarcomatous infiltration, but symptoms once established usually persist.

What has already been said about the tendency of sarcomatous disease to attack the cerebellum or the cerebellopontile angle may give some aid in differentiating multiple sarcomatosis as it does in separating cases of isolated sarcoma from those due to basal syphilis. In the case of multiple sarcomatosis particularly referred to in this paper, tumors were present in both cerebellopontile angles, and an operation was performed with the view of exposing one of these and at the same time relieving the patient's suffering.

THROMBOSIS OF THE MIDCEREBRAL ARTERY CAUSING APHASIA AND HEMIPLEGIA.[1]

By CHARLES W. BURR, M.D.,

PROFESSOR OF MENTAL DISEASES IN THE UNIVERSITY OF PENNSYLVANIA.

REMARKS ON CEREBRAL SKIAGRAPHY.

By G. E. PFAHLER, M.D.

THE point to which we wish to direct attention in the following report is the usefulness of skiagraphy in diagnosing cerebral disease and in locating the lesion. The importance of the method in tumor of the brain is well established. It probably will become of great value in the differential diagnosis of so-called uræmic hemiplegia, in which there is no gross organic lesion, from hemorrhage and thrombosis. It may possibly prove to be an aid in differentiating between the two last conditions by means of the different location of the shadows, hemorrhage usually affecting the striate artery, thrombosis often of the main trunk as well as its branches. The patient's history is as follows:

R. C., a white woman, aged sixty-seven years, was admitted to the Philadelphia Hospital in February, 1901. She had a right-sided hemiplegia and was aphasic. We learned but little of her previous history. Thirty years before her admission she suddenly lost power on the right side and became speechless. After several months sufficient power returned in the leg to enable her to walk a little, but speech never returned. Ever since the onset of the palsy epileptiform convulsions have recurred at long and irregular intervals.

When examined, the day after her admission, she could stand alone and, with the aid of a cane, walk a little. The gait was very hemiplegic. The right arm was completely and absolutely paralyzed. There was very slight palsy of the lower part of the face and none of the tongue. The right leg was slightly rigid. The right shoulder was very stiff, the forearm rigidly flexed upon the

[1] Read at the Pennsylvania State Medical Society, June 24, 1903.

reveal anything explanatory of these symptoms. Nonne regards them as an expression of intoxication. He quotes cases reported by Gläser,[1] Oppenheim,[2] and Senator,[3] in support of this opinion. In Gläser's case there was a glioma of the medulla oblongata which extended downward as far as the sixth cervical segment. Basal symptoms were prominent. Oppenheims' case was one of lymphosarcoma of the anterior mediastinum, with the symptom-complex of polioencephalomyelitis. Bulbar symptoms were pronounced. The microscopic examination did not explain the symptoms, and Oppenheim thought the lymphosarcoma was the cause of the symptom-complex. Senator's case was one of multiple myelomata of the ribs, with nephritic complication. Here, too, the bulbar symptoms were prominent, and the findings did not satisfactorily explain the symptoms. The macroscopic examination of the medulla oblongata in our case revealed nothing, but in the microscopic examination some of the cells of the hypoglossus nuclei were found distinctly diseased. The nuclei of some of the cells were displaced toward the periphery, the chromophilic elements were disintegrated, and in some of the cells there was an excess of yellow pigment. We were not able to detect any implication of the hypoglossal nerves in a carcinomatous mass, and it is probable that the alteration of the hypoglossal nuclei was caused by some poisonous product of the numerous carcinomata.

[1] Deutsche med. Wochenschr., 1897, No. 52, p. 835.
[2] Deutsche Zeitschr. f. Nervenheilkunde, vol. xv. p. 1.
[3] Berliner klin. Wochenschr., 1899, No. 8.

CLINICAL AND HISTOLOGIC STUDY OF THE OPHTHAL- MIC CONDITIONS IN A CASE OF CEREBELLAR NEOPLASM OCCURRING IN A SUBJECT WITH RENAL DISEASE.[1]

By Charles A. Oliver, A.M., M.D.,
OF PHILADELPHIA.

In the month of February, 1898, A. C. T., a white woman, aged forty-eight years, married, and the mother of one living child, came under the care of Dr. J. Hendrie Lloyd in the Wards for Nervous Diseases at the Philadelphia Hospital. Dr. Lloyd's most careful notes of the case state that the principal complaints of the patient upon her admission into the hospital were double vision "with incomplete loss of vision in the left eye," and weakness in the legs and lumbar region. The patient's family history showed that both her father, a man aged seventy-nine years, and her mother, a woman aged sixty-nine years, were living. The patient was one of thirteen children, of whom four brothers and four sisters were living; of the remaining four children, all brothers, two died during infancy; the third in adult life (from hypertrophic cirrhosis of the liver), and the fourth from some unknown cause.

The patient had had "all of the diseases of childhood." She first menstruated at twelve years of age, and had been "regular" up to her forty-sixth year of age, the epochs usually lasting for three or four days' time. The flow was always moderate in quantity, and the crisis was never painful. Menopause had been slowly though undisturbingly establishing itself for the past two years. She had one living healthy child. She never had any miscarriages. Seven years before admission she had suffered from an attack of acute articular rheumatism, followed four years later by inflamma- tion of the lungs. She reported that she had never had venereal disease, and she had never had any gross accidents or operative interference. She had never used alcohol or tobacco.

She said that following her recovery from the pneumonia she suffered from occipito-vertical pains and vomiting at each pre-

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menstrual period, the headache having ceased during the last eight attacks, but the vomiting being preceded by gross exacerbations of nausea. She stated that she had been unable to walk without assistance for three years' time. For two years she had had "weakness in the lower part of the back." There was frequent desire with difficulty in micturition, the patient not always being able to urinate. There had never been any retention or incontinence of urine. Her bowels had been constipated much of the time for fully a year.

Four weeks before she was seen she had experienced a severe attack of nausea and vomiting which had lasted for three days' time. Just previous to this attack she had had so much dizziness as to cause her to fall from a chair. After this accident she noticed that objects appeared double and that she was told at times that her eyes seemed crossed. At this time vision with the left eye began to fail. These symptoms were almost immediately followed by loss of vision in the left eye. The vertiginous seizures persisted, though to a much less degree, while the patient was placed in a prone position.

Upon admission to the hospital, the patient appeared to be well nourished. Her radial pulse was 100, small and compressible. Her heart sounds were rapid, the second beat being accentuated. The tongue was protruded straight, and there was not any marked tremor. There was not any trembling of the lips. The masseter, the temporal, and the pterygoid muscles acted well. Neither the sensory nor the motor portions of the fifth nerve seemed involved. A slight trembling of the hands and arms upon extension was noticeable. Hand grip was equally good on both sides. Sensation and localization were good in both arms. The biceps jerks were apparent. The patellar tendon reflex was exaggerated on the right side, and ankle clonus was absent on both sides. The plantar reflex was increased, while sensation in the legs was somewhat greater than normal. Pressure upon the sacral region gave rise to tenderness. Station was poor, while gait was slightly ataxic in character. There was marked inco-ordination. Examination of the urine gave a low specific gravity, a minor amount of albumin, and the presence of a few granular and hyaline casts.[1]

The pupil of the right eye was 1 mm. larger than that of the left, which was 4 mm. wide in the horizontal meridian. Iris reactions to light stimuli were very feeble, and were not so good in the left eye as in the right one when gross attempts at accommodative efforts were made. A medium degree of paresis of the left external rectus

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[1] ...et interesting and instructive difference between these findings and those of the
had been examined eight years previously, see later notes in report of this case.

half. (Fig. 2.) The posterior horn and middle portion of the left ventricle were much enlarged and the outer wall was entirely lateral membranous, the cortex and underlying white matter being entirely destroyed. It is remarkable that the patient was not completely word deaf. The amount of speech hearing she possessed must have been due to the education and vicarious action of the right temporo-sphenoidal lobe.

FIG. 4.
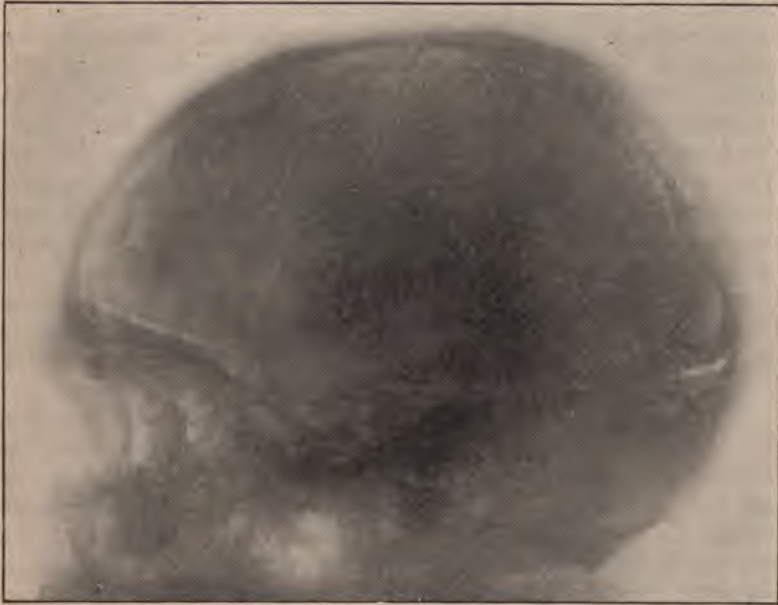
Skiagraph showing a normal brain in a skull prepared for experiment, also shows the outline of the skull, the two tables of the skull, the frontal sinus, which is unusually small, the sphenoidal and mastoid cells, and the external auditory meatus. The division between the cerebrum and the cerebellum may also be seen.

The case is interesting in many ways, for example, as regards aphasia and differences in vascular distribution, for it is probable that there is quite a variation in the arterial distribution in different brains, but I wish to use it here simply as showing the possibilities of skiagraphy in the hands of an expert such as my friend Dr. Pfahler.

The visual fields were lessened somewhat concentrically with the presence of great numbers of mutable relative and absolute scotomatous areas with fixed enlargements of the physiological blind spots. There was not any accommodative play, the one-half dioptre type being clearly and fixedly defined at 30 cm. when looked at through a convex spherical lens of four dioptres' strength with the right eye, and the three-quarters of a dioptre type being seen clearly at 25 cm. distance with the same correcting lens. Intraocular tension in each eye was normal.

The ticking of a watch, which could be heard at 30 cm. distance from the right ear, was not audible even when the watch was held close to the left ear.

Upon re-examination of the ocular conditions eleven days later it was found that the patient was unable to make use of the lower fibres of the left orbicularis muscles, the upper fibres, and particularly those in the unstriated series at the inner angle, being but slightly contractile, with compensatory movement of the globe, given in order to place the cornea beneath the upper lid.

Ophthalmoscopic examination of both eye-grounds as pictured in the accompanying sketch (Fig. 1) of the left eye-ground, made by Miss Margaretta Washington, of this city, showed fresh hemorrhages, both superficial and deep, in the retinal tissues. The swelling of the optic disks had subsided to about two dioptres, and the tissues of the nerve-heads had become much thickened. The retinal plaques and patches noted in the previous study still existed.

In the lower part of the superficial layers of the left cornea there was a large saturated and markedly anæsthetic ulcerous area, which was rapidly extending into the corneal layers, giving rise to an extreme irritability of the eyeball. The conjunctival membrane, particularly that portion of it which was situated in the neighborhood of the ulcerous spot, was proliferating its external squamous cells, and there was a corresponding desquamation of the neighboring epithelium. The previous convergence was now noted as having become bilateral, this being produced by a paresis of the right external rectus muscle, though to a lesser degree than that of the left eye.

At this time the patient voluntarily gave the information that for the first time she had experienced attacks of irritation phosphenes in the shape of golden rain, which was situated directly in front of the right eye. The visual fields both for form and color were lessened irregularly to a greater degree than they had been at the earlier examination. Intraocular tension had become slightly

diminished in the inflamed eye.   Vision with this eye had decreased to an uncorrectable one-thirtieth of normal.

From this time on vision in both eyes steadily failed until she became practically blind; postneuritic changes set in; muscle palsies of the most bizarre types appeared; and the general condition gradually weakened until in some six weeks' time after she had been first studied she died from apparent uræmic poisoning.

A most careful autopsy was made.   The scalp and the calvaria did not present anything abnormal.   The dura mater was not especially adherent.   There was not any excess of fluid in the subarachnoid spaces.   The small vessels of the pia mater were injected, and the large ones were distended.   The membrane itself was almost transparent.

Springing from the left lobe of the cerebellum was a cone-shaped mass which proved to be sarcomatous in character.   The apex of the growth was nipple-shaped and projected forward to a point which was situated slightly anterior to the middle line of the pons varolii and reached to within 1½ cm. of the origin of the left crus cerebri.   The base of the tumor was found to be placed somewhat anterior to the middle of the left cerebellar hemisphere.   The tumor-mass was 3 cm. broad at its base; its total length was 55 mm., and its greatest width was 33 mm.   Laterally, toward the median line, the growth pressed upon the medulla oblongata, while on the left side it rested upon the posterior part of the pons varolii.   The medulla, which was flattened laterally, was twisted on its longitudinal axis in such a manner that it was directed at an angle of forty-five degrees away from the median line, causing its normally placed left lateral surface to be turned obliquely upward.   The growth was sharply circumscribed and could be readily removed from the cerebellum.   Its posterior aspect was covered by pia mater, while its anterior face was possibly similarly conditioned.

The mass, which was firm in consistency, had an irregularly convoluted surface, resembling that of brain tissue.   Upon section, it was yellowish-red in color and exhibited a few distended vessels and small free hemorrhages.

The seventh and eighth nerve trunks on the right side appeared to be in good condition, while the corresponding left ones were swollen and indistinct.   There was a marked softening of the pons varolii in the position where the neoplasm pressed upon it.   This softening extended to about 2 cm. in advance of the growth.   The tumor was adherent to the base of the skull.

After removal of the brain it was found that the posterior part of the petrous portion of the temporal bone was deeply eroded.   The

cavity made by the growth was 2 cm. long, 14 mm. wide, and 1 cm. deep. The central part of this excavation corresponded in position to that of the internal meatus. The bone surface in the excavated area was rough and was crossed by a series of serrated elevations. The cavity was filled with soft tumor-like masses of reddish tint.

The body was emaciated. The cæcum and ascending colon were distended with gas. The appendix was bound to the cæcum and the ascending colon by adhesions. The pleuræ were free. Both the right and left lower lobes of the lungs were somewhat congested, while the upper lobes were slightly emphysematous. There were a few adhesions between the lobes of the left side. The pericardium showed a great deal of fatty infiltration. The heart muscles were some 18 mm. thick. Both the aortic and the pulmonary valves were normal; the tricuspids were thickened. The mitral valve exhibited a few yellowish opaque spots. The liver was small, its right lobe being 19 cm. long and its left lobe 16 cm. long; its average thickness was 4¾ cm. The gall-bladder projected for some 5 cm. beyond the surface of the liver. There was a slight increase of connective tissue between the lobules of the organ. The interior of the aorta was both roughened and thickened. The spleen was small, very dark in tint, and quite soft. The pancreas did not present anything abnormal. The left suprarenal capsule showed fatty degeneration in its cortex. The capsules of both kidneys could be stripped with difficulty. The organs themselves were somewhat smaller in size than normal. Their cortices, which were red in tint, were reduced in thickness. The pyramids were fibroid in character. The pelvic membranes were injected, those of the left kidney being infiltrated with pus. The bladder was contracted; its walls were greatly thickend, and its cavity was filled with pus.

The posterior halves of the eyes, together with the orbital portions of the optic nerves, were removed and placed in formalin.

Some few months later, while inspecting some notes in my clinical service at Wills Hospital, I unexpectedly came across a carefully prepared record of this patient who had visited my out-patient service in December, 1890. The symptoms complained of at that time were typically those of renal disease. The ophthalmic examination, which was most complete, showed the presence of some faint star-like degeneration radii in both macular regions, with a few superficial and deeply seated hemorrhages in the papillomacular areas, in association with a small mosaic of pigment aggregations with intervening fatty degenerations, slightly down and out from the left optic nerve-head, and extending into the macular region. Vision with the right eye was reduced to four-fifths of normal and

to two-thirds of normal with the left eye. The visual fields were large. They presented proper color sequences and were well shaped; small but negative central scotomas being present. Examination of the urine at that time revealed a fluid of good specific gravity, but containing a faint trace of albumin and some granular casts. The patient, who was ordered an appropriate regimen and was given a prescription for Basham's mixture, failed to return after the third visit.

Through the kindness of Dr. Edward A. Shumway of this city, the left eyeball was embedded in celloidin, and sections were made through the optic nerve and neighboring ocular tunics.

Macroscopically, the optic nerve was much thinner than ordinary, and its intraocular extremity showed decided swelling.

Microscopically, the optic nerve-head was found to be swollen, the result of the swelling being $\frac{87}{100}$ mm. above the level of the lamina vitrea of the chorioid. The tissues were infiltrated with a great number of cells which had assumed spindle-like forms; these cells being particularly numerous around the vessels, forming complete mantles in places. (*Vide* sketch by Dr. Ellen C. Potter, Resident Physician at the Woman's Hospital of Philadelphia). In those sections which were stained by the Van Gieson method, the intercellular substance stained with fuchsin, and appeared to be composed of fine connective-tissue fibres (by the contraction of which the optic nerve fibres had become atrophic, as no trace of them could be found). The vessel walls were very much thickened and the lining endothelial cells were proliferated, but the chief increase in thickness was situated in the adventitia. Embedded in the swollen nerve-head were several irregularly round bodies, staining faintly pink with eosin, and light red with the Van Gieson reagents. These bodies were without structure, and resembled those which are found in the nerve-head in senile conditions of the eye. Similar formations were also found in the intervaginal space. The fibres of the lamina cribrosa were thickened and extended further forward than usual. Posterior to the lamina cribrosa, on the temporal side, the intervaginal space was widely distended, and the cavity thus formed, which extended backward for a distance of 1 mm., was filled with a loosely coagulated fluid and crossed by swollen connective-tissue processes. Everywhere else the space between the dural and pial sheaths was filled with a mass of proliferating cells. These cells were similar in type to the endothelial cells that line the processes of the arachnoid. In consequence of these changes, no lymph space existed around the optic nerve. The connective-tissue septa within the optic nerve were normal

in thickness and were moderately infiltrated with lymphoid cells
—particularly around the central vessels. The decrease in the
diameter of the nerve was due to an almost complete atrophy of the
nerve fibres. With the Weigert sheath stain only an occasional
tenuous thread, continuing for a short distance to end in a minute
globule, could be seen.

The retina exhibited circumpapillary inflammation and œdema.
The changes were situated chiefly in the outer layers, and con-
sisted in hypertrophy of the supporting elements, their separation
by fluid, and the formation of cystic cavities.

FIG. 2.

Spindle-like cells around vessels in swollen optic nerve-head.

In one place (the macular region) there was a mesh-like deposit
of fibrin, such as is common in retinitis albuminurica. Swollen,
fatty cells were occasionally seen, but no hemorrhages could be
found. The rods and cones were degenerated, their outer ends
being converted into irregularly shaped masses. The fibre layer of
the retina showed œdema and hypertrophy of the supporting fibres,
but there were not any large cavities. The nervous elements in
this layer had apparently disappeared, no fibres could be deter-
mined, and but a few of the cells present could be isolated as highly

degenerated ganglion cells. The vessels showed the same changes as those in the optic nerve-head. The so-called retinal pigment cells were decidedly proliferated, and the surface of the chorioid presented several masses of partially organized exudate to which some of the cells of the outer retinal layer remained adherent.

The chorioidal vessels were widely distended with blood, which contained numerous polymorphonuclear leukocytes; the stroma being moderately infiltrated with mononuclear round cells.

REMARKS. The case is of interest from several standpoints: the formation of a cerebellar tumor of sarcomatous type in a subject with previous renal disease; the existence of a low grade macular chorioretinitis in both eyes, with the characteristic ophthalmoscopic phenomena of a true retinitis albuminurica without any coarse signs of endarteritis or perivasculitis eight years before the gross type of neuroretinitis, which is so peculiar to increased intracranial pressure, and particularly to that which is found in subtentorial neoplasms, appeared; the masking of the primary changes in the macular regions by the later gross ones of neuroretinitis with their post-mortem exposure by the microscope (i. e., the finding of the solitary remnant of the previous localized retinal and chorioidal inflammation from disturbance in the vascular network—the mesh-like deposit of fibrin); the final rapid loss of vision in so brief a period of time (three months) (the reason for which was so well shown post-mortem by the almost, if not quite complete, atrophy of the nervous elements of the retina and the optic nerve); the disappearance of the negative scotomas with the subsequent irregular peripheral contraction, with remaining star-like sectors, of the rapidly lessening visual fields; the progressive types of exterior and interior ocular pareses and palsies, which were always more marked in the groups of the left side; the occurrence of trophic disturbances in the corneal membrane of the left eye (the eye which was always the one which was the more greatly involved); the enormous lengthening of the fibres of Müller—especially in the nuclear layers of the retina—giving rise to irregular elevations on the outer surface of the retina, and the gross hyperæmia and moderate degree of inflammatory infiltration of the chorioid.

she had an abscess of her right breast, which ruptured and discharged pus. Four years afterward she had pain across her back and around her waist, the pain being sharp in character. Lately she has had some pain in her lower limbs. She dates her disease from the beginning of these pains. Three weeks after they began she was obliged to take to her bed, and has been confined to her bed ever since. She has been constipated for the past four years, and has had incontinence of urine for about a month.

Present Condition. There is an extensive bed-sore over the left trochanter. The patient has a scar over her right breast. The lower limbs are very much atrophied, being hardly more than skin and bones, and are contractured at each knee. She has foot-drop on each side. The thighs in the median portion measure seven and one-half inches, and both legs in the median portion measure six inches. There are no fibrillary tremors in the muscles of the lower limbs.

The patellar jerks are absent on each side, but this may be due to the intense atrophy. Tapping the left patellar tendon causes slight adduction of the right thigh, but there is no movement on tapping the right patellar tendon. The Achilles jerk is absent on each side, and Babinski's reflex is not obtained, the toes not being moved. Tactile sensation cannot be tested, the patient not replying. Pain sensation seems much diminished. Pricking the lower limbs with a pin is perceived, but not correctly localized, and seems to cause intense pain. She complains of spontaneous pain in her left thigh. The feet are not contractured, but there is contracture at each hip. Voluntary movement of the toes is impossible.

Upper Limbs. The grip of each hand is almost nil. Both upper limbs are much wasted, especially the left, but there are no contractures. The movements are free, but weak. The thenar and hypothenar eminences on both sides are atrophied, but no more so than the rest of the upper limbs, which are not atrophied proportionally to the lower limbs. The biceps, triceps, and wrist jerks are exaggerated on each side. Testing the reflexes in either upper limb causes severe pain. The right upper arm in its middle portion measures six inches, the left five and one-half inches. Each forearm in its middle portion measures four and

one-half inches. Tactile sensation cannot be tested, but response to pin prick is quick.

The muscles of the face are extremely atrophied; the lips are very thin; the tongue is atrophied on each side and is protruded very slightly beyond the line of the teeth. There are no fibrillary tremors of the face and tongue. The fifth and seventh nerves are normal. There is corneal opacity of the right eye, and the right pupil is contracted. The left iris reacts to light, but it is diffi-cult to determine the light reaction of the right iris. Pain sen-sation is sharply perceived in the face.

The patient was in the hospital only three days before death occurred, but the presence of a scar in her breast; the evidence of involvement of the spinal cord, as shown by the contractures; the atrophy and weakness of the extremities, the shooting pains and the tenderness to the slightest pressure gave the typical picture of paraplegia dolorosa, and the diagnosis of carcinoma of the vertebræ was made after the case was carefully considered.

The necropsy was performed by Dr. Simon Flexner. His notes are as follows: "The skull-cap contains two metastases, one the size of an almond, the other smaller. They project from the outer table of the skull. On removing the spinous processes and laminæ of the spinal column it is found that the bony struc-tures are rendered soft by the growth of the tumor into them. The bodies of the vertebræ also contain masses of tumor through-out in the bony and in the cartilaginous intervertebral disks. These often project in the floor of the spinal canal. Two growths directly into the canal have taken place, one measuring 2 cm., the other $5\frac{1}{2}$ cm. They are attached to the outer surface of the dura mater, and cannot be seen to penetrate the outer membranes. The cord is compressed by the growths. The smaller nodule is $8\frac{1}{2}$ cm. from the medulla oblongata, the larger $10\frac{1}{2}$ cm. They are firm, grayish-white masses, and were closely applied to the inner wall of the canal, from which they were separated in removing the spinal cord. The brain shows no metastases. The dura mater is adherent to the skull, but there are no metastases. There is a sclerotic carcinoma of the breast, and metastasis also in the sternum, ribs, liver, spleen, and kidney."

The microscopic examination is as follows:

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The carcinomatous tissue which is present on the outside of the dura does not penetrate very far into the dura, and distinct carcinomatous tissue is not seen within this membrane. The inner part of the dura in some places contains an accumulation of cells which are oval or elongated, mingled with much fibrous tissue, and do not assume the form of carcinoma masses. Some perivascular cellular infiltration is found within the cord where these carcinomatous masses are present on the outer side of the dura. The carcinomatous masses are chiefly on the posterior part of the spinal dura.

The crossed pyramidal tracts are much degenerated in the lumbar region, and there is some degeneration on one side at least in the area the posterior roots occupy in entering the cord. The nerve cells of the anterior horns of the lumbar region are considerably altered. In many the nucleus is displaced, the cell bodies swollen or else much atrophied, and in many there is an excess of pale yellow granular matter.

Cervical Region. The column of Goll and the lateral columns are considerably degenerated. Slight degeneration is found in the columns of Burdach. In the lateral columns the degeneration extends farther forward than the area of the crossed pyramidal tracts. The direct cerebellar tracts and Gowers' tracts are a little affected. The nerve cells of the anterior horns are in much the same condition as those in the lumbar region. The Marchi method shows considerable degeneration in each crossed pyramidal tract in the lumbar region and of the columns of Goll in the cervical region.

CASE II.—M. B., female, aged twenty-eight years, single, was admitted to the Philadelphia General Hospital, June 11, 1902, in the service of one of us (Dr. Spiller). The notes made at that time (Dr. Spiller) are as follows: In February of this year the patient suffered with intense pain all over the back, and a little later the lower limbs became weak. Eight weeks ago her legs gave away, and she fell out of her chair, but she says her lower limbs were weak before the fall. There is no weakness of the upper limbs. Her family history and personal history are negative. Six or seven years ago she had numerous abscesses in front of the chest and abdomen, the scars of which can be seen.

Four years ago the patient was thrown down by a bicycle. She has been operated upon twice for necrosis of the bones of the knees. The present examination shows that the legs are flexed at the knees and the thighs upon the abdomen. The feet are contractured in extension, and the contractures at each knee are distinct, especially at the right knee. All the extremities are wasted, the lower especially. Trophic disturbances are present in the feet and soles. The loss of power in both lower extremities is almost complete, except that the patient can flex the right thigh slightly upon the hip. The patellar jerks are much exaggerated, especially this reflex on the left side. Ankle clonus is present on the left side, but not on the right. Both Achilles jerks are exaggerated. The Babinski reflex is obtained on each side. Sensation for touch and pain is irregularly absent over the dorsal surface of each foot. Any irritation of the limbs causes pain in the feet and back. It is probable that hyperalgesia exists in the lower limbs, as a slight pin-prick causes severe pain in the back and limbs. The upper limbs are normal, the reflexes and sensation not being disturbed. Bedsores are present over the sacrum.

At the autopsy the seventh, eighth, and ninth thoracic verterbæ were found soft and friable, and the meninges were thickened, but were not adherent to the cord. The meningeal vessels were dilated. Gross examination of the cord showed about the mid-thoracic region on the outer side of the dura, on its anterior and right side, a tuberculous mass about two and one-half inches long. Its upper portion reached to the mid-thoracic area.

Microscopic Examination. The secondary degeneration in the columns of Goll in the cervical region is slight, as is also the secondary degeneration in the crossed pyramidal tract of the lumbar region. Recent minute hemorrhages are found in the gray and white matter of the cervical region. The nerve cells of the anterior horns of the lumbar region appear to be normal, while those of the cervical region may be a little diseased. The anterior and posterior roots of the lumbar and cervical regions are normal.

Neither in the history of this case nor in the post-mortem record is there any mention made of a spinal deformity, and one

of us (Dr. Spiller) has a distinct recollection that there was no deformity of the vertebral column in this case. Absence of deformity is rather unusual in a case of spinal caries. Most authors admit that this may occur.

CASE III.—E. P., female, aged forty-nine years, housewife, was admitted to the nervous wards of the Philadelphia General Hospital, April 18, 1903, service of Dr. Pearce. Her father died of tuberculosis. She has had the ordinary diseases of childhood, denies venereal history, and says she never drank. A daughter says that the patient had rheumatism of one or both ankles six years ago, occurring at irregular intervals, and later involving both knees. There was no weakness or stiffness of the lower limbs, and the wrists were not involved until two years ago, when the daughter says that the contractures of the lower extremities began. One year ago the patient began to act strangely, would declare she saw strange faces, had delusions of varying character, and at times became violent. She had at this time attacks of violent pain in her stomach and had vomiting spells. The physicians at that time made a diagnosis of cancer of the stomach.

The patient came into the service of Dr. Spiller, June, 1903. Notes made about one month after admission by one of us (Dr. Weisenburg) are as follows; The patient's mental condition is poor. Bed-sores are present over the buttocks, and there are sores over the malleoli of both ankles. There is incontinence of urine and feces. The lower limbs are flexed—the leg on the thigh, the thigh on the abdomen. The left leg is swollen, the right is not. Both knee-joints are decidedly swollen. Pressure over the patella does not show any fluid in the knee-joints, which are rigid. The patient complains of pain at the slightest pressure. On turning the patient over from side to side no movement of the knees is seen. It is impossible to test for the reflexes of the lower extremities on account of the pain. Plantar irritation produces no movement of the toes in either direction.

Resistance to passive movement of the upper extremities is poor, and the grip of each hand is almost nil. The distal and middle phalanges are in extension. Atrophy of the hands and forearms is marked on each side. The biceps jerks are present on each side, but diminished, while the triceps and wrist reflexes

are absent. One month ago Dr. Mann attempted to straighten the knee-joints under ether, and extension was applied to the lower extremities, but without satisfactory results.

The blood count at this time was as follows: Hæmoglobin, 58 per cent.; white corpuscles, 11,000; red corpuscles, 3,180,000. Differential count showed nothing. The urine was normal.

A further examination (by Dr. Spiller), June 2, 1903, gave the following results: The patient has had incontinence of urine and feces for the last three months. She seems to have difficulty in hearing. The deafness was not present when her daughter last saw her. Any handling of the patient causes her great pain. The face is much emaciated. The pupils are equally dilated, and respond equally and promptly to light. There is no paralysis of the facial nerve on either side. The masseter contracts on each side, but not forcibly. The tongue is protruded in the median line, and there is no tremor or atrophy. The upper limbs are much emaciated, especially the hands, and voluntary movement of the upper limbs is much restricted, especially at the shoulder and elbow. The patient never bends her fingers, and moves her hand with the fingers extended. The biceps, triceps, and wrist reflexes are absent on each side. Pin-prick is felt in each hand. Attempt to take any of the reflexes of the upper and lower limbs gives great pain. There is great tenderness to pressure along the spinal column. She cannot move the lower limbs at all, and these limbs seem to be completely paralyzed. The patient's mental condition is impaired, although she understands what is said to her, if said distinctly.

She died June 3, 1903.

The necropsy was performed by Dr. Yates. A few old foci of tuberculosis were found at the apex of each lung. Both knee-joints were filled with what was considered to be tuberculous pus, and the bones were eroded. The breasts were negative, as was also the stomach. There was no general glandular enlargement. There was also fatty degeneration of the liver and heart, and the kidneys were in a state of chronic parenchymatous nephritis.

The results of the microscopic examination are as follows:

The nerve cells of the anterior horns of the cervical and lumbar regions are intensely altered, as shown by the thionin

POINTS OF RESEMBLANCE BETWEEN PARALYSIS AGITANS AND ARTHRITIS DEFORMANS.[1]

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(From the Philadelphia General Hospital.)

A LITTLE more than a year ago I exhibited before the Philadelphia County Medical Society, in the discussion of a paper by Dr. Riesman, a case of what I believed to be rigidity of the spinal column with a tremor of only the right upper limb, like that occurring in paralysis agitans. The case was remarkable in certain of its features, and the diagnosis was difficult. No one could dispute that the tremor was very suggestive of paralysis agitans; but it was not easy to determine whether the rigidity of the spinal column, the kyphosis of the cervicothoracic region, the scoliosis of the upper thoracic spine, the deformity of the hands, like that of arthritis deformans, the crepitation of the knee-joints, the muscular atrophy, the talipes equinovarus and equinocavus, were to be attributed to the paralysis agitans or not. Extreme paralysis of the lower limbs, like that occurring in this case, is uncommon in paralysis agitans, but not unknown. A brief reference has been made to this case by Dr. Pearce.[2]

The patient was under my observation during many months, and died in the service of Dr. Mills, to whom I am indebted for the pathological material.

The notes of the case are as follows:

S. H., aged fifty-nine years, was admitted to the Philadelphia Hospital May 27, 1901. The family history was unimportant.

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[1] Read before the College of Physicians of Philadelphia, March 2, 1904.
[2] Philadelphia Medical Journal, May 25, 1901, p. 1017.

She had been twice married, and had had three miscarriages.

About two years before admission she began to have disturbance of gait, her legs became weak, and she had some pain, and was obliged to use crutches. About one year later she became unable to walk at all. Twelve years before admission her neck became rigid, and she had been unable to straighten her neck since that time. She said the rigidity occurred after she had washed her hair and sat in a draught to allow it to dry. The following morning the back of the neck was swollen and her head was bent forward. She had not suffered any pain from this rigidity of the neck. It is questionable whether the patient's recollection of an event occurring twelve years previously was reliable.

At the time of admission both lower limbs were swollen from the knees downward, and she had considerable pain in the right knee. Both were tender to touch. The left leg below the knee was very much swollen, especially about the ankle. The swelling and pain on handling probably were caused by œdema. The grip was very weak in the right hand, and this condition had been present since the legs were affected. The disease had developed gradually. There was no history of a stroke. Her eyes were normal. The knee-jerks appeared to be absent. The mental condition seemed to be fairly good.

The patient came into my service June 1, 1901, and on June 22, 1901, the following notes were dictated by me:

The lower limbs are atrophied, the atrophy being conspicuous in the thigh of each side, but is masked by œdema in the leg below the knee on each side, the œdema being especially marked in the left leg below the knee. Distinct pitting on pressure is obtained in the whole left leg below the knee, but on the right side only in the foot. The lower limbs are very weak. The patient can draw up her lower limbs at the hips, and can flex them at the knees; but the movements are much restricted in all parts of the limbs. Passive movements at the right hip are not so free as at the left hip, although there is no ankylosis. Considerable crepitation is obtained in each knee. The right knee is much enlarged and presents the appearance of an old joint affection. The left knee is not normal in appearance, but chronic arthritis is not apparent here. The right thigh in its middle portion

measures twelve and one-half inches; the left thirteen and one-half inches. Movement of the toes of each foot is very slight. Resistance to passive movements in both lower limbs is very feeble The patellar reflex on the right side is not obtained, but it is difficult to get the patient to reinforce; on the left side the patellar reflex is very feeble, and detectable only by slight contraction of the quadriceps muscle. Babinski's reflex is not obtained on either side, the movement being neither flexion nor extension.

Sensation for touch and pain in the lower limbs is normal.

No fibrillary tremors are present in the lower limbs. The patient is unable to stand.

Upper Limbs. The fingers of each hand at the metacarpophalangeal articulations are deflected toward the ulnar side. Marked flexor contractures are observed at the metacarpophalangeal joints, but the fingers are hyperextended at the articulations of the second with the third phalanges.

It is possible that a mistake was made in recording this note, and that the hyperextension occurred at the articulations of the second with the proximal phalanges.

The condition is such as occurs in arthritis deformans. The upper limbs and trunk are very much atrophied. Voluntary movements and resistance to passive movements of the upper limbs are proportional to the degree of muscular development.

Sensation for touch and pain in the upper limbs and over the trunk is normal. The patient has a coarse tremor involving all parts of the right upper limb. This tremor sometimes ceases when the limb is at rest, but not always, and at times the tremor is partially arrested by voluntary movement of the hand. This tremor is suggestive of Parkinson's disease. There are no fibrillary tremors in the upper limbs or trunk.

The patient is unable to sit up in bed unassisted. The head inclines forward and to the left, and there is marked kyphosis at the cervicothoracic junction. The neck can be partially straightened, but not fully, as the resistance in the neck is too great. Voluntary movement of the spinal column is greatly restricted in all directions. No involvement of any of the cranial nerves is detected.

Urinary examination made June 15, 1901, gave the following results :

Specific gravity 1022 ; few pale granular casts ; pus cells ; trace of albumin ; no sugar.

Very little change occurred in the patient's condition. She died at 3 o'clock A.M. January 27, 1903.

Fig. 1.—The photograph was taken after the death of the patient. The deformity of the neck is very slightly exaggerated. The back is remarkably straight, and a gradual bending forward, such as is not uncommon in paralysis agitans, is not seen. (Photograph taken by Dr. H. R. Alburger.)

The necropsy was made by Dr. A. E. Ellis, January 27, 1903, at 11.30 A.M. His notes, abbreviated, are as follows :

Pathological Diagnosis. Œdema and infarction of lungs; atheroma of the aorta, chronic mitral endocarditis, fatty infiltration of the heart, and cloudy swelling, acute parenchymatous nephritis, fatty liver.

muscle, together with a slight paresis of the corresponding orbicularis muscle, could be determined both objectively and subjectively. There was imperfect action of the muscles which were supplied by the left oculomotor and pathetic nerves.

The ophthalmoscope showed that there was a marked degree of neuroretinitis, the swollen tissues of the left optic nerve-head being denser and more extensive than those of the right eye (seven dioptres as compared with six dioptres for the right optic nerve-head swell-

FIG. 1.

Ophthalmoscopic appearance of left eye-ground.

ing). There were numerous superficial and deeply seated hemorrhages in both the neural and retinal tissues, particularly along the larger temporal vessels. Great numbers of commencing degeneration areas could be seen in both papillomacular regions, though more pronounced in the left eye.

Uncorrected vision with the right eye equalled one-third of the normal, this being improved to one-half of normal by having the patient gaze through a pinhole. Vision with the left eye was one-sixth of normal, being brought to one-fifth by use of the pinhole.

has reported a case in which violent contractions in the muscles of the arm and forearm, shoulder and breast, seemed to be caused by anterior meningomyelitis, extending from the fourth cervical to the first thoracic segment. The irritation of the anterior roots was supposed to have caused the contractions. I may refer in this connection, also, to a case of tumor of the cerebral peduncle reported by Blocq and Marinesco,[1] which caused a tremor of the left hand like that of paralysis agitans. This case showed that tremor, even though typical, is not an absolutely reliable sign of paralysis agitans. The general appearance of my patient was so strikingly like that of paralysis agitans that this disease was believed by most of those who examined her to be the cause of the tremor.

Is it possible that the whole symptom-complex was that of paralysis agitans, and that arthritis deformans was not present in the case? If so, then paralysis agitans is capable of causing certain conditions much like those of arthritis deformans, but this resemblance between the two diseases has received scarcely any attention from physicians. It may be that a study of the two diseases in their points of resemblance to one another may throw light on each. The pathology of each is most obscure. Both have been regarded as of nervous origin, but in neither has this origin been satisfactorily demonstrated. Many years ago the elder J. K. Mitchell advanced the theory of a nervous origin of arthritis deformans.

Recent investigations have shown very distinct degenerative changes in the muscles in paralysis agitans, to which I shall refer presently, and it is probable that in arthritis deformans the muscles are affected simultaneously with the joints, possibly even in advance of the joint disease.

Rigidity of the spinal column, caused by rigidity of the muscles of the back, occurs in paralysis agitans in association with rigidity of the muscles elsewhere in the body, but may we expect deformities of the vertebral column in paralysis agitans?

J. A. Sicard and L. Alquier,[2] who have studied the deviations of the vertebral column in paralysis agitans, remark that in the

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[1] Mémoires de la Soc. de biologie, 1893, p. 105.

Iconographie de la Salpêtrière, 1902, vol. xv. p. 377.

recent as well as in the older works, from the time of the first article by Parkinson, in 1817, to that of Grasset and Rauzier (*Traité de Médecine*; Brouardel et Gilbert, t. x.) no mention is made of deformities of the spinal column caused by paralysis agitans. The attitude in which the body and head incline forward has been described frequently.

Sicard and Alquier have found pronounced deviations of the vertebral column in twelve of the seventeen cases of paralysis agitans they studied, and in some the deformity was very great, as shown by their photographs. They believe that these abnormalities of the spinal column depend upon the muscular rigidity, and develop as the muscular rigidity develops. The deformity may be kyphosis, scoliosis, or lordosis, or a combination of these.

None of their cases were with necropsy, and in many of them, if we may judge from the photographs accompanying their article, the deformity consisted of a gradual bowing of the vertebral column, but in some of the photographs scoliosis is shown.

The most common cause of rigidity of the spinal column, according to Oppenheim, is arthritis deformans. This may implicate the entire vertebral column or only the cervical portion, so that the head is flexed upon the breast. Oppenheim[1] thinks we shall do wisely to classify all these cases of rigidity of the spinal column under chronic articular rheumatism, gout, or arthritis deformans, and this is a view held by many.

Rigidity of the back caused by muscular disease has recently received attention from E. Barg,[2] and he is able to refer to cases of this type reported by Beer, Popoff, Schlesinger, Zenner, Cassirer, and Senator. Cassirer[3] refers to cases in which disease of the muscles of the back seemed to usher in the disease of the vertebral column.

In the Strümpell-Marie type the process is confined to the vertebral column and the large joints; pain is unimportant, and the vertebral column is straight, except that kyposis of the cervical part occurs. This is similar to the condition in my case. S. H. had a remarkably straight spine, except in the cervicothoracic

[1] Lehrbuch der Nervenkrankheiten, third edition, pp. 274 and 275.
[2] Zeitschrift für klin. Med., 1903, vol. l. p. 304.
[3] Berliner klin. Wochenschrift, 1902, Nos. 10 and 11.

region, where a prominent kyphosis was present; the shoulders, at least the right, were supposed to be ankylosed, but it is probable that the restriction of movement was caused by muscular rigidity. No ankylosis of the vertebræ could be detected at the necropsy, and under the kyphosis the bodies of the vertebræ were a little more rigid than normal, and yet not positively ankylosed. We were not permitted to remove the vertebræ from the cadaver.

Was, therefore, the remarkable kyphosis of the cervicothoracic spine in the case of S. H. the result of the rigidity of the muscles of the back and neck, which Sicard and Alquier have shown may produce very intense deformity of the vertebral column in paralysis agitans; and was the slight rigidity of the lower cervical and upper thoracic vertebræ that we detected at the necropsy also the result of this muscular rigidity? The question cannot be positively answered, but I believe it should be answered in the affirmative. Clinically the kyphosis and scoliosis were such as occur in arthritis deformans. I have referred to the fact that some investigators believe that vertebral disease may be secondary to muscular disease.

Few authors describe the ulnar deviation of the fingers in paralysis agitans. Williamson,[1] in his recent monograph on this disease, says: "The fingers are near to each other, and sometimes the terminal phalanges of the fingers are flexed, more or less, on the second phalanges, and the second phalanges hyperextended on the proximal phalanges as in rheumatoid arthritis. Also the fingers sometimes deviate toward the ulnar side of the hand."

Gowers,[2] in a footnote, remarks: "In rare cases the digits deviate toward the ulnar side, as in chronic rheumatoid arthritis."

In S. H. the ulnar deviation and contractures of the fingers were exceedingly like those occurring in arthritis deformans, but there is the evidence of a few observers that such conditions may occur in paralysis agitans. I have been able within the past year to study a case of unilatera paralysis agitans, and it has been to me of great interest to note that the ulnar deviation of the fingers occurred only in the hand showing the characteristic tremor of the

[1] On Paralysis Agitans. Sherratt and Hughes. Manchester, 1901.
[2] A Manual of Diseases of the Nervous System, J. & A. Churchill 1893. vol. ii. p. 644.

to two-thirds of normal with the left eye. The visual fields were large. They presented proper color sequences and were well shaped; small but negative central scotomas being present. Examination of the urine at that time revealed a fluid of good specific gravity, but containing a faint trace of albumin and some granular casts. The patient, who was ordered an appropriate regimen and was given a prescription for Basham's mixture, failed to return after the third visit.

Through the kindness of Dr. Edward A. Shumway of this city, the left eyeball was embedded in celloidin, and sections were made through the optic nerve and neighboring ocular tunics.

Macroscopically, the optic nerve was much thinner than ordinary, and its intraocular extremity showed decided swelling.

Microscopically, the optic nerve-head was found to be swollen, the result of the swelling being $\frac{8.7}{100}$ mm. above the level of the lamina vitrea of the chorioid. The tissues were infiltrated with a great number of cells which had assumed spindle-like forms; these cells being particularly numerous around the vessels, forming complete mantles in places. (*Vide* sketch by Dr. Ellen C. Potter, Resident Physician at the Woman's Hospital of Philadelphia). In those sections which were stained by the Van Gieson method, the intercellular substance stained with fuchsin, and appeared to be composed of fine connective-tissue fibres (by the contraction of which the optic nerve fibres had become atrophic, as no trace of them could be found). The vessel walls were very much thickened and the lining endothelial cells were proliferated, but the chief increase in thickness was situated in the adventitia. Embedded in the swollen nerve-head were several irregularly round bodies, staining faintly pink with eosin, and light red with the Van Gieson reagents. These bodies were without structure, and resembled those which are found in the nerve-head in senile conditions of the eye. Similar formations were also found in the intervaginal space. The fibres of the lamina cribrosa were thickened and extended further forward than usual. Posterior to the lamina cribrosa, on the temporal side, the intervaginal space was widely distended, and the cavity thus formed, which extended backward for a distance of 1 mm., was filled with a loosely coagulated fluid and crossed by swollen connective-tissue processes. Everywhere else the space between the dural and pial sheaths was filled with a mass of proliferating cells. These cells were similar in type to the endothelial cells that line the processes of the arachnoid. In consequence of these changes, no lymph space existed around the optic nerve. The connective-tissue septa within the optic nerve were normal

hypothesis with great caution. It is my desire merely to call attention to this subject, so that further study be devoted to it.

Recently Schiefferdecker[1] has found degeneration of the muscle fibres within the muscle spindles in a case of paralysis agitans. The muscle spindles are probably concerned in the recognition of the degree of contraction of the muscles ; therefore, alteration of these organs probably causes uncertainty regarding the muscular contraction and interference with the reflexes, and consequently uncertainty in the voluntary use of the muscles. The nerves within the muscle spindles and within the surrounding muscles were normal, and consequently the alteration of the muscle fibres probably was primary. Schiefferdecker regards the degenerative changes of the muscle spindles as of great importance in explaining paralysis agitans.

He has found also what he regards as a specific degeneration of the muscles in which were the degenerated muscle spindles. This degeneration was not seen in all parts of the muscles. It began in the sarcoplasm.

These investigations give renewed interest to the study of the muscles in paralysis agitans, and yet Schiefferdecker is not hasty in his conclusions, and believes that some cause still unknown produces in paralysis agitans changes in the nervous and muscular systems. It may be that some similar cause produces the changes of arthritis deformans, in which the muscles, as well as the joints, are affected, and attention should be directed to the condition of the muscle spindles and of the voluntary muscles in arthritis deformans.

It is interesting in this connection to recall that in progressive muscular dystrophy, a disease believed to be of muscular origin, the bones do not always escape.

DISCUSSION.

Dr. S. Weir Mitchell : I have listened with a great deal of interest to this most valuable paper. I think I can recall cases in which it was difficult to decide to which disease to assign the symptoms. There is this to be said, however, that while you

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[1] Deutsche Zeitschrift für Nervenheilkunde, vol. xxv. Nos. 1–4.

see in late paralysis agitans some of the symptoms which belong to arthritis deformans, in the latter malady you may see, I think, extreme examples of difficulty and uncertainty in movement, with absolutely no tremor. I have such a case now in mind. This is the only remark of any importance which I wish to contribute to this discussion.

DR. JAMES TYSON : It is well recognized that there are cases of paralysis agitans which present all the symptoms of the disease except tremor, and, therefore, is named *paralysis agitans sine agitatione,* just as we have an *angina pectoris sine dolore.*

DR. A. A. ESHNER : I merely want to emphasize what I understood Dr. Tyson to say, that in some cases of paralysis agitans tremor is at times, at least, though perhaps not permanently absent. I have placed on record a case, and I can recall at least one other, in which tremor was at times entirely absent, and the patient presented merely the characteristic facies and attitude and a certain amount of rigidity. I confess, however, that the existence of arthritis deformans did not suggest itself.

DR. W. G. SPILLER : The suggestion that Dr. Mitchell has made has occurred to me, also. I think no one would say that tremor is a sign of arthritis deformans ; but in a certain number of cases of paralysis agitans there is no tremor.

In my paper I have carefully avoided anything which would indicate that I believed the two diseases to be identical. I avoided saying resemblance of arthritis deformans to paralysis agitans, and have said " Points of resemblance " to show that they are not identical. I have endeavored to point out that there is a similarity which may be greater than we have supposed.

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A CLINICAL REPORT OF THREE CASES OF INJURY TO THE LOWER SPINAL CORD AND CAUDA EQUINA:

WITH REMARKS UPON PERONEAL PALSY DUE TO A LESION IN THE EPICONUS, UPON INCREASE OF THE PATELLAR TENDON REFLEXES FROM A LESION BELOW THE LUMBAR SEGMENT, AND UPON A RARE FORM OF BROWN-SÉQUARD PARALYSIS RESULT-ING FROM A LESION OF THE LOWER END OF THE SPINAL CORD.[1]

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(From the service of Dr. Wm. G. Spiller, Philadelphia and Polyclinic Hospitals.)

THE following three cases are reported because of their unusual symptoms. The first case presents bilateral peroneal palsy with typical steppage gait due to a lesion in the epiconus—*i. e.*, that portion of the spinal cord between and including the fifth lumbar and first and second sacral segments. Peroneal palsy is almost always due to a peripheral lesion. The second case is one with increased patellar reflexes with a lesion in the cauda equina, below the reflex arc for the knee-jerk. This condition has not been here-tofore dwelt upon. The third case is interesting because of a form of Brown-Séquard paralysis peculiar to cases of unilateral lesions in the lower end of the cord. In this type motion and sensation are affected in the same lower limb, while sensation in the external genitalia and perineum of the opposite side is also disturbed.

CASE I.—J. K., aged thirty-five years, laborer, while walking on a railroad track was struck by an engine going at a moderate rate of speed. He was struck in the middle of the back and was thrown about thirty-five feet. He was picked up in an unconscious condi-tion, and when admitted to the University Hospital two hours after-ward consciousness had returned. He had always been healthy up to this time (January 5, 1901). His family history and past history

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[1] Read before the Philadelphia Neurological Society, October 27, 1903.

are negative. Examination on admission showed numerous lacerations of the head, ears, a broken nose, and subconjunctival ecchymosis. The back in the mid-dorsal and lumbosacral region was contused, but no fracture or dislocation of the vertebræ could be made out. The man complained of intense pain in the back and of a burning sensation in his feet, which was aggravated by pressure. There was complete motor paralysis of his lower extremities. Vesical control was lost. No rectal disturbances were present. Examination three days after the injury by Dr. Potts gave the following results: The patient can voluntarily contract the quadriceps and adductor muscles of either thigh. He is able to raise the thigh slightly from the bed. No atrophy is noticeable in the lower extremities. All muscles respond to the faradic current. All the reflexes in both lower extremities—i. e., the patellar jerk, Achilles jerk, and ankle clonus—are absent. Plantar irritation produces no movement of the toes. He cannot pass his urine voluntarily, but knows when his bladder is full. To-day he defecated voluntarily. Sensation for touch, pain, and temperature is lost over the dorsum of both feet, and on the outer side of both legs to the knees. He complains of an intense burning and numb feeling in both feet, especially marked when pressure is applied. He does not know when his toes are moved. A beginning bed-sore is found over the sacrum.

A note made twenty-five days after the injury states that vesical control was normal. Examination by Dr. Potts a month after injury gave the following results: the patellar jerks are still absent. The Achilles jerk is present on each side and is marked more on the right. Plantar irritation produces a doubtful extension of toes on both sides. The muscles are flabby and somewhat atrophied. No change in electrical reactions is found. Sensation is about the same as at the previous examination. From this time on his condition gradually improved, the patellar jerk on the left side returned two months later. Six months after the injury he was able to be out of bed and could walk with the aid of crutches, at which time it was noticed that he had a typical "steppage" gait. He left the University Hospital April 30, 1902, and could then walk without the aid of a cane, and was admitted later to the nervous wards of the Philadelphia Hospital, service of Dr. William G. Spiller.

Examination on September 30, 1903, by me showed a wasting of the buttocks and of both lower extremities, more marked on the right side, there being a difference of one inch above and one-half inch below the knees. He lies with both extremities strongly abducted. Motor power is diminished on the right side more than on the left. The flexors of the right thigh are weak, while power of adduction of both thighs is greatly diminished, and more so on the

right side.   He can flex and extend the toes slightly, but no move-
ments are possible at the ankle-joints, and he has bilateral foot-drop.
The patient walks with a swinging step, lifting his foot high from
the ground, and has a distinct steppage gait.

The cremasteric reflex is prompt on either side.   The left patellar
tendon reflex is much exaggerated; on the right side, however, there
is no movement of the leg on the thigh from tapping the patellar
tendon, but a strong contraction of the quadriceps muscle can be
easily felt.   Ankle clonus is prompt and persistent on both sides.
Babinski's sign is present on either side.   There is a hypæsthesia for
all forms of sensation over the dorsum of both feet, extending on the
outer side of both legs to the knees.   Bladder and bowel control are
normal.   All the muscles of the lower limbs respond to the faradic
current.

The lesion in this case was most probably a hemorrhage into the
spinal cord or a traumatic myelitis between the fourth lumbar and
third sacral segments of the spinal cord.   The absence of bladder,
rectal, and sexual disturbances shows that the conus medullaris,
arbitrarily put by Raymond between the beginning of the filum
terminale and the third sacral segment, and including that segment,
and that the fibres in the lateral columns controlling these reflexes
are intact.   The paralysis involves principally the peroneal group
of muscles on either side, while the adductors and flexors of the
thighs, especially on the right side, are paretic; in addition, there is
a weakness of the glutei.   The cells in the anterior horns of the
spinal cord controlling these muscles have been placed by various
authors between the fourth lumbar and third sacral segments, some
writers placing the centres for the adductors and flexors as high as
the third lumbar segment.   The upper limit of the lesion is shown
by the presence, in fact, the exaggeration of the patellar tendon
reflexes and the preservation of the cremasteric reflex, these re-
flexes showing the integrity of the fourth lumbar segment and the
lumbar segments above.

The case affords evidence that the cremaster reflex arc must have
its spinal portion above the fourth lumbar segment, and that it is
not in the sacral cord, as some writers have taught, and that the
reflex arc for ankle clonus must be below the second sacral seg-
ment.   The preservation of the bladder, rectal, and genital reflexes
seems to indicate that the white matter of the lateral columns is
not seriously affected, even in the lower lumbar and upper sacral
cord, and that the lesion must be almost confined to the gray matter.

Minor,[1] of Moscow, pointed out in 1901 that just such a symptom-

[1] Deutsche Zeitschr. f. Nervenheilkunde, 1901, p. 334.

complex always occurs in lesions involving the gray matter of this area—i. e., the fifth lumbar and first and second sacral segments. In such cases the paralysis always involves the distribution of the sacral plexus, and the peroneal group of muscles is most affected and the paralysis of these muscles lasts the longest. In some of his cases there was paresis of the flexors and adductors of the thigh. The negative symptoms were preservation of the patellar reflexes and absence of bladder and rectal disturbances. He called this region of the spinal cord the epiconus. Similar observations have been recorded by others, Remak,[1] Wagner and Stolper, Kötter, Barth and Hartmann, and Erb, but none by English and American writers, so far as I know. The important feature of these cases is the involvement of the gray matter of the fifth lumbar, and first and second sacral segments with integrity of the white matter.

CASE II.—J. C., aged thirty-one years, white, laborer, was admitted to the Philadelphia Hospital July 13, 1903. He was shot June 8, 1903, in the left buttock with a thirty-eight calibre Colt revolver about ten feet away, the ball entering and perforating the left fifth lumbar vertebra, as was shown afterward by the x-rays. The course of the bullet was downward and to the right; the ball, however, has not as yet been located. The patient could not walk during the first two weeks and had no control of the bladder or rectum. Examination by Dr. Spiller, July 18, 1903, one month after injury, showed that voluntary power in the lower limbs was nearly normal, except in the flexors of the right foot. Both patellar jerks were a little prompter than normal. The Achilles jerk was absent on either side, and Babinski's sign was absent, there being no movement of the toes in either direction. There was an area of greatly diminished sensation for touch and pain over the right buttock, extending about three or four inches from the median line, and in a narrow zone back of the right thigh and back of the right leg, and on the outer side and sole of the right foot, corresponding, according to Kocher's diagram, with the distribution of the second, third, and fourth sacral segments. The sensation in the left lower limb was normal. He had incontinence of the bladder and bowel.

Examination by me October 11, 1903, three months after the injury, showed the patient's condition to be much improved. The flexors of his right foot were still weak and he could not rotate outward his right thigh as well as he should. The right buttock was flat, there being atrophy of the glutei. Sensation was about the same as at the previous examination, with the addition of a hypæsthesia of the right side of the scrotum and penis.

[1] Quoted by Daus., S. Monatsschrift f. Psych. u. Neurol., B. xiii., H. 5, S. 394, 1903.

Both cremasteric reflexes were present, and both patellar tendon reflexes were distinctly increased. No Achilles jerk nor Babinski's sign was obtained on either side. He could hold his urine, but the power of the bladder was still diminished. He was constipated, and after a purgative could not control the rectum. All the muscles responded to the faradic current, except the right glutei, there being also no response in these muscles to the galvanic current.

The lesion in this case must have implicated the cauda equina, as the bullet entered at the fifth lumbar vertebra, and its course was downward. The interesting point of this case, and the one I wish to call special attention to, is the increase of the patellar tendon reflexes when the lesion was below the reflex arc. I have been unable to find any reference to this condition in the literature at my command, except in Thorburn's[1] contribution to the *Surgery of the Spinal Cord*. This author mentions the following cases with increase of the patellar reflexes, but pays no special attention to this subject. One case I have found also reported by Franz Volhard.[2]

First case, cited by Thorburn from Kirchoff: backward crushing of the first lumbar vertebra causing a degeneration of the fourth and fifth sacral segments, the only symptoms being paralysis of the bladder and rectum and increased patellar reflexes. Sexual and sensory changes are not mentioned.

Second case: a partial compression of the cauda equina about the level of the last lumbar vertebra, causing severe neuralgic pains in the sciatic and pudic distributions, a weakness of some of the muscles of the lower limbs, but no complete paralysis and no anæsthesia of the limbs. The bladder and rectal functions were paralyzed. The patellar reflexes were slightly exaggerated, but there was no ankle clonus.

The third case is cited by Thorburn from Oppenheim, and was one of fracture of the first lumbar vertebra, causing a myelitis of the conus medullaris. There was a slight weakness of the calf muscles, otherwise no loss of power or atrophy. Anæsthesia was limited to the peroneal region and buttocks. There was paralysis of bladder and rectum. Here also the knee-jerks were exaggerated, but there was no ankle clonus.

The fourth case, by Volhard, of a tumor of the cauda equina, as proved by necropsy, with motor and sensory symptoms, absent Achilles jerks, and weakness of the plantar reflexes, but both the patellar reflexes and the cremasteric reflexes were exaggerated.

In all four of these cases, therefore, the exaggeration of the patellar reflexes was probably caused by lesions *below* the reflex arc.

[1] Philadelphia, Blakiston & Son, 1889.
[2] Deutsche med. Wochen., 1902, No. 33.

has reported a case in which violent contractions in the muscles of the arm and forearm, shoulder and breast, seemed to be caused by anterior meningomyelitis, extending from the fourth cervical to the first thoracic segment. The irritation of the anterior roots was supposed to have caused the contractions. I may refer in this connection, also, to a case of tumor of the cerebral peduncle reported by Blocq and Marinesco,[1] which caused a tremor of the left hand like that of paralysis agitans. This case showed that tremor, even though typical, is not an absolutely reliable sign of paralysis agitans. The general appearance of my patient was so strikingly like that of paralysis agitans that this disease was believed by most of those who examined her to be the cause of the tremor.

Is it possible that the whole symptom-complex was that of paralysis agitans, and that arthritis deformans was not present in the case? If so, then paralysis agitans is capable of causing certain conditions much like those of arthritis deformans, but this resemblance between the two diseases has received scarcely any attention from physicians. It may be that a study of the two diseases in their points of resemblance to one another may throw light on each. The pathology of each is most obscure. Both have been regarded as of nervous origin, but in neither has this origin been satisfactorily demonstrated. Many years ago the elder J. K. Mitchell advanced the theory of a nervous origin of arthritis deformans.

Recent investigations have shown very distinct degenerative changes in the muscles in paralysis agitans, to which I shall refer presently, and it is probable that in arthritis deformans the muscles are affected simultaneously with the joints, possibly even in advance of the joint disease.

Rigidity of the spinal column, caused by rigidity of the muscles of the back, occurs in paralysis agitans in association with rigidity of the muscles elsewhere in the body, but may we expect deformities of the vertebral column in paralysis agitans?

J. A. Sicard and L. Alquier,[2] who have studied the deviations of the vertebral column in paralysis agitans, remark that in the

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[1] Mémoires de la Soc. de biologie, 1893, p. 105.

[2] Nouvelle Iconographie de la Salpêtrière, 1902, vol. xv. p. 377.

From this time on the patient improved steadily, and was discharged from the hospital September 1, 1903, about two months after admission.

Examination at present, three months after injury, gives the following results: The patient is able to walk without the aid of crutches, although still weak. The left lower limb seems normal. The right lower limb is generally wasted as compared with the left lower limb. All movements of the toes, ankle, knee, and hip on the right side are possible, although not quite normal. The patellar tendon reflexes, Achilles jerk, and ankle clonus are absent on either side.

Diagram showing the motor and sensory fibres implicated within the spinal cord in Case III. A. Unilateral lesion implicating the lumbar and sacral regions below the line represented by A. B. The motor fibres of one side of the cord for the innervation of the lower limb. C. The sensory fibres from the same lower limb, decussating above the lesion. E. The sensory fibres from the perineum and external genitalia of the opposite side, decussating below the lesion. D. The sensory fibres from the opposite lower limb, decussating above the lesion.
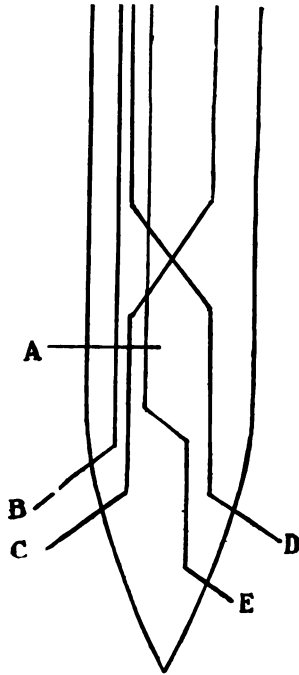
Plantar irritation produces no movement of the toes. The cremasteric reflex is absent on the right and prompt on the left side. There is no absolute loss of sensation in the right lower limb, but he does not feel touch and pain as well as he should, and he complains of numbness in the anterior part of the thigh and foot. The bladder, bowel, and sexual functions are still impaired. Sensation is normal over the left lower limb, but touch and pain sensations are diminished over the left half of the penis and scrotum.

The interesting feature of this case is the Brown-Séquard symptom-complex, as shown by the weakness of the right lower limb and the hypæsthesia for touch and pain in the same lower limb, while on the other side there is hypæsthesia for the same forms of sensation over the left side of the penis and scrotum. The lesion must have been a traumatic myelitis of the right side of the spinal cord or an intramedullary hemorrhage, sufficiently high to involve some of the motor and sensory fibres of the same side supplying the right lower limb, but not high enough to involve the sensory fibres supplying the left lower limb after their decussation to the opposite side. It has been shown that the sensory fibres of the pudendal plexus decussate lower in the spinal cord than do the sensory fibres supplying the lower extremities. This case seems to prove this view to be correct, because there was hypæsthesia for touch and pain over the penis and scrotum and possibly over the perineum on the left side, opposite the side to that in which was the lesion, while in the left lower limb sensation was normal.

We may expect therefore in a case of unilateral lesion in the sacral and possibly the lower lumbar region of the spinal cord, disturbance of motion and sensation in the lower limb and in the external genitalia and perineum on the same side as the lesion, and disturbance of sensation in the external genitalia and perineum of the opposite side. This explanation for this symptom-complex is made more comprehensible by the accompanying figure. This is a form of Brown-Séquard paralysis, but very different from that occurring when the lesion is higher in the cord.

This interesting symptom-complex was first described by Wernicke[1] in 1891. Later, Mann[2] described more fully the same case, and added a similar one of his own. So far as I know these two are the only previous cases on record. A short abstract of these cases is given below:

CASE I.—Patient, aged thirty-two years, had not had syphilis, and previously had been healthy. One evening he complained of intense pain in the back and a weakness in the left lower limb. This increased so that he could not use his leg at all. Pain disappeared shortly and paresis improved. Six months after this he presented a flaccid paralysis of the left lower limb; the only muscle acting was the iliopsoas. All the reflexes were lost. He never had bladder, rectal, or sexual disturbances and no pain in his left leg. Sensation for pain and temperature was diminished in the left lower extremity as compared with the right lower extremity. On

[1] Sitzungsberichte der schlesischen Gesellschaft f. faterländische Cultur. Sitzung vom 6 Februar. 1891, ferner Gesammelte Aufsätze, p. 300.

[2] Zeitsch. f. Nervenheilkunde, vol. x.

disease. In old cases of paralysis agitans I have found deformities of the hands like those of arthritis deformans so frequently that I cannot regard them as an evidence of the association of the two diseases.

The crepitation of the knee-joints does not fully establish rheumatic disease of these joints, and the muscular atrophy, though unusual in paralysis agitans in my experience, might be explained by the long confinement of the patient to her chair and bed, for it was not intense. The deformities of the feet may be regarded as

FIG. 2.—Photograph of the hands in a typical case of paralysis agitans, with ulnar deviation of the fingers only in the hand in which tremor was observed.

a sign of paralysis agitans as truly as those of the hands, although they do not appear to have been described.

The rigidity of the spinal column, the kyphosis of the cervico-thoracic region, the scoliosis of the upper thoracic spine, the deformities of the hands and feet, the crepitation of the knee-joints, and the muscular atrophy, do not prove that the paralysis agitans was complicated by arthritis deformans, but force upon us the question whether there be not some relation between these two mysterious diseases. I wish to be understood as advancing this

A CLINICAL REPORT OF THREE CASES OF INJURY TO THE LOWER SPINAL CORD AND CAUDA EQUINA:

WITH REMARKS UPON PERONEAL PALSY DUE TO A LESION IN THE EPICONUS, UPON INCREASE OF THE PATELLAR TENDON REFLEXES FROM A LESION BELOW THE LUMBAR SEGMENT, AND UPON A RARE FORM OF BROWN-SÉQUARD PARALYSIS RESULTING FROM A LESION OF THE LOWER END OF THE SPINAL CORD.[1]

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(From the service of Dr. Wm. G. Spiller, Philadelphia and Polyclinic Hospitals.),

THE following three cases are reported because of their unusual symptoms. The first case presents bilateral peroneal palsy with typical steppage gait due to a lesion in the epiconus—i. e., that portion of the spinal cord between and including the fifth lumbar and first and second sacral segments. Peroneal palsy is almost always due to a peripheral lesion. The second case is one with increased patellar reflexes with a lesion in the cauda equina, below the reflex arc for the knee-jerk. This condition has not been heretofore dwelt upon. The third case is interesting because of a form of Brown-Séquard paralysis peculiar to cases of unilateral lesions in the lower end of the cord. In this type motion and sensation are affected in the same lower limb, while sensation in the external genitalia and perineum of the opposite side is also disturbed.

CASE I.—J. K., aged thirty-five years, laborer, while walking on a railroad track was struck by an engine going at a moderate rate of speed. He was struck in the middle of the back and was thrown about thirty-five feet. He was picked up in an unconscious condition, and when admitted to the University Hospital two hours afterward consciousness had returned. He had always been healthy up to this time (January 5, 1901). His family history and past history

[1] Read before the Philadelphia Neurological Society, October 27, 1903.

cases with necropsy have occurred in his services at the Poly-
clinic Hospital and the Philadelphia Hospital, and are report-
ed in the present paper. These make six cases with necropsy
reported in detail in America. The other two were reported
by Burr and McCarthy[6] and by Hunt.[7] The frequency of
multiple sclerosis in Europe is well known, and in 1898 atten-
tion was called by one of us (Spiller[8]) to the rarity of the diag-
nosis in America. At that time little or nothing had been
said concerning this subject further than the remark in the
edition of Dana's text-book published in 1892 and omitted in
later editions.

The two additional cases with necropsy which we now re-
port are as follows:

CASE 1.—Miss M. C., twenty-eight years of age, a dress-
maker by occupation, was referred to the Polyclinic Hospital,
clinic of Dr. Spiller, August 19, 1903. The notes of the first
examination made by Dr. Weisenburg are as follows:

Her father died from "consumption of the bowel." Her
mother has rheumatism and is hysterical.

Miss C. began to menstruate when she was twelve years
old, and has been very irregular. She began sewing when
she was sixteen years of age. She has always been sickly
and very nervous. Last September she noticed stiffness in
her lower limbs when she got up in the morning, and she had
difficulty in moving her lower limbs. She had also a numb
sensation in these limbs and could not feel a pin prick at all.
She never has had pain, although she has a sensation as of a
tight band about the lower limbs. The sensation of stiffness
has partially disappeared, but when she grows excited the
paresthesia is increased. When she gets up in the morning
she feels as though she were walking on rubber. She was
confined to her bed for seven months. About last Christmas
she noticed that she could not hold her urine so well as pre-
viously. She is obstinately constipated. Her memory is some-
what impaired, and the vision of the right eye seems dimin-
ished. The upper limbs have not been stiff. She says that at
times she drags her left lower limb and may fall while
walking.

She walks well with her eyes open, but is ataxic, although
she does not fall, when her eyes are closed. She staggers
when standing with eyes closed. The patellar reflex is exag-

[6]Burr and McCarthy. JOURNAL OF NERVOUS AND MENTAL DISEASE,
1900.
[7]Hunt. American Journal of the Medical Sciences, Dec., 1903.
[8]Spiller. The Philadelphia Polyclinic, 1898, p. 147.

gerated on each side, but more so on the left, and patellar clonus is obtained on the left side. Ankle clonus is not present. Babinski's sign is obtained on each side. The upper limbs are not affected. She has inframammary and inguinal tenderness.

The pupils are equal and the irides respond to light and in accommodation and convergence. The tongue is normal. The fifth and seventh nerves are not affected.

Miss C. was admitted to the Polyclinic Hospital September 9, 1903, and was seen by one of us (Dr. Spiller), and the notes then made are as follows:

The patient shows no muscular atrophy. The lower limbs are not spastic. The patellar reflex is a little exaggerated on each side, and there is a tendency to patellar clonus on each side, but no true patellar clonus. The Achilles jerk is normal on each side; Babinski's reflex is present on each side, the big toe being moved distinctly upward. Tactile sensation is preserved all over the body, but the patient says she feels a touch more distinctly in the upper limbs than in the lower. Pain sensation seems to be normal everywhere. She has some inguinal tenderness on the left side. The grasp of the hands is normal. Resistance to passive movement in the upper limbs is normal. The biceps tendon, triceps tendon and wrist reflexes are normal on each side. The pupils are equal, or possibly the right is a little smaller than the left. The reaction of the iris to light and in accommodation is normal The tongue is protruded straight and shows no tremor and nc atrophy. The facial muscles are not implicated on eithei side. Constipation is obstinate. Speech is not affected. Nys-tagmus was not observed in this or in any examination. Speech was not peculiar. A diagnosis of diffuse lesions in the posterior and lateral columns was made.

On September 16 a note was recorded that the patient was delirious and talked irrationally, and had had involuntary micturition while asleep. The patient was found excited and anxious about her condition, and probably worried by something that had occurred in her past history, but she was rational.

On September 18 she was sitting quietly in the ward. She got up suddenly and jumped out of a third story window. She was not unconscious as a result of this fall, and her head did not appear to be injured. Both bones of the right forearm were broken at the lower third and a compound comminuted fracture of the left wrist was found. The back of the trunk was badly contused over the buttocks as high as the lower thoracic vertebræ, and a depression over the spinal column was found at the lumbo-thoracic junction. The lower limbs were paralyzed.

On September 19 the following notes were made: The pa-

tient talks freely and it is evident that she is worried by some private affair. The bowels and bladder are paralyzed. She has complete paralysis of the lower limbs and cannot even move the toes. The patellar reflex is lost on each side. There is no ankle clonus and Babinski's sign is not obtained. The level at which sensation for touch is preserved can not be accurately determined because of the patient's inability to fix her attention on the examination. A pin prick is not felt at all in the left lower limb, and very imperfectly in the right lower limb; but is felt over the whole of the abdomen. The head and upper limbs except where the fracture has occurred, are not affected.

An X-ray examination made September 22 seemed to show an injury of the second and third lumbar vertebræ.

The patient had fever about 101°, varying from 1½ to 2° daily, pulse 116 to 132, respiration 24 to 28. She became gradually weaker and died October 3.

The necropsy was made by Dr. Randolph. His notes abbreviated are as follows: Extravasation of blood is found over the lower anterior surface of the sternum, and especially over the anterior surface of the spinal column. A subdural hemorrhage is present over both occipital lobes, but the skull is not fractured. The first lumbar vertebra is fractured, and the body of this vertebra is displaced backward. At the seat of fracture the spinal cord is softened and disorganized, but above this level the cord appears to be normal.

The microscopical examination gives the following results: The spinal cord below the third lumbar segment is softened as a result of the fracture of the first lumbar vertebra. Sections from the lower part of the second lumbar segment or upper part of the third lumbar segment show several areas of sclerosis, and the area of the left crossed pyramidal tract contains fewer nerve fibers than in normal sections, and presents the appearance of secondary degeneration. Symmetrical areas of sclerosis are found in the anterior and posterior columns. In sections stained by hemalum and acid fuchsine a slight round cell infiltration is seen about some of the vessels in the spinal cord and in some parts of the pia. The nerve cells of the anterior horns stained by the acid fuchsine are much degenerated. They are swollen and their nuclei are eccentric. This alteration is probably the result of the fracture. The Nissl method could not be employed. Sections from about the same level stained by the Marchi method show much recent degeneration widely distributed. Numerous bundles of degenerated fibers coming from the posterior roots are seen entering the left posterior horn. Similar bundles are not found in the right posterior horn, because at this level the right posterior horn was implicated in a sclerotic

Both cremasteric reflexes were present, and both patellar tendon reflexes were distinctly increased. No Achilles jerk nor Babinski's sign was obtained on either side. He could hold his urine, but the power of the bladder was still diminished. He was constipated, and after a purgative could not control the rectum. All the muscles responded to the faradic current, except the right glutei, there being also no response in these muscles to the galvanic current.

The lesion in this case must have implicated the cauda equina, as the bullet entered at the fifth lumbar vertebra, and its course was downward. The interesting point of this case, and the one I wish to call special attention to, is the increase of the patellar tendon reflexes when the lesion was below the reflex arc. I have been unable to find any reference to this condition in the literature at my command, except in Thorburn's[1] contribution to the *Surgery of the Spinal Cord*. This author mentions the following cases with increase of the patellar reflexes, but pays no special attention to this subject. One case I have found also reported by Franz Volhard.[2]

First case, cited by Thorburn from Kirchoff: backward crushing of the first lumbar vertebra causing a degeneration of the fourth and fifth sacral segments, the only symptoms being paralysis of the bladder and rectum and increased patellar reflexes. Sexual and sensory changes are not mentioned.

Second case: a partial compression of the cauda equina about the level of the last lumbar vertebra, causing severe neuralgic pains in the sciatic and pudic distributions, a weakness of some of the muscles of the lower limbs, but no complete paralysis and no anæsthesia of the limbs. The bladder and rectal functions were paralyzed. The patellar reflexes were slightly exaggerated, but there was no ankle clonus.

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The fourth case, by Volhard, of a tumor of the cauda equina, as proved by necropsy, with motor and sensory symptoms, absent Achilles jerks, and weakness of the plantar reflexes, but both the patellar reflexes and the cremasteric reflexes were exaggerated.

In all four of these cases, therefore, the exaggeration of the patellar reflexes was probably caused by lesions *below* the reflex arc.

[1] Philadelphia, Blakiston & Son, 1889.
[2] Deutsche med. Wochen., 1902, No. 33.

Sclerotic areas are not seen in the medulla oblongata or pons.

The right optic nerve is almost completely degenerated as far as the commissure, where the degenerated area is sharply marked off from the normal area. The left optic nerve is not degenerated.

Case 2.—P. B., a male, aged twenty-four years, came to the Polyclinic Hospital May 19, 1898, to the service of one of us (Dr. Spiller). He had been a collector, and in this occupation had walked much and been much exposed to wet and cold; later he had worked in a machine shop.

The family history is unimportant. The patient denies venereal disease but says he had masturbated freely. He has been losing power in his lower limbs for the past nine months, but has no loss of power in the upper limbs, and no pain anywhere, no headache and no involuntary seminal emissions. About five months previously he had difficulty in holding his urine, but only during a period of about two weeks. He has been constipated during the past two months. He has no girdle sensation. Sight has been poor during the past year. Six or seven months previously he frequently stubbed his toes in walking.

His gait is very ataxic. Romberg's sign is present. The patellar reflex is much exaggerated on each side, but ankle clonus is not obtained on either side. Achilles jerk is very prompt on each side. Sensation is normal everywhere. The upper limbs are distinctly ataxic. The irides react promptly to light and in accommodation, and the voluntary movements of the eyeballs is good. Slight nystagmus is present when the patient looks to the right and upward. Contraction of both visual fields is present, and is most marked in the temporal side. There are no gross changes in the eyegrounds.

The patient was lost sight of after he had been coming to the clinic for a long time, but in the early part of 1901 he was admitted to the Philadelphia Hospital and soon came into the service of Dr. Spiller. He had been confined to his bed about a year on account of weakness of the lower limbs. Atrophy had not developed.

Notes made April 9, 1901, are as follows: The patient is unable to walk at all. He can stand a few minutes with support, but his legs soon give away. Both upper and lower limbs are incoördinate, and the left lower limb more so than the right. The reaction of the iris to light and in accommodation is slow. Nystagmus is present. The extraocular muscles are not affected. Beginning optic atrophy is found in each eye. The facial muscles are not implicated, and the tongue is protruded straight.

September 10,1901.—The lower limbs are somewhat emaciated, but not excessively so. No contractures are observed anywhere. The lower limbs are spastic, and the spasticity is increased by passive movements. The patellar reflexes and the Achilles tendon reflexes are exaggerated, and ankle clonus is obtained. Sensation for touch and temperature is diminished in the lower limbs, but for pin prick is normal. Babinski's sign is present on each side. Both lower limbs are paralyzed, but the toes can be moved slightly. He is unable to raise himself in bed, and turns his body over with great difficulty. The voluntary movements of the upper limbs are good. Speech is weak and slow, but not scanning and not explosive.

July 31, 1903.—There is slight ptosis of each upper eyelid. Nystagmus is present when the patient looks directly in front of him. Speech is somewhat explosive but not scanning. The upper limbs are weak. The man is emaciated. Intention tremor is present and more marked in the left upper limb than in the right. Tactile sensation is lost in the portion of the body between the knees and a line two inches below the nipples, but sensation for pin prick is preserved everywhere. He has no incontinence of urine and feces.

An examination of the eyes made about this time showed that the temporal side of the disc in each eye was abnormally white, suggesting incipient atrophy.

The man died August 10, 1903, from phthisis and chronic nephritis.

A microscopical study of the spinal cord and brain from this case gives the following results:

The areas of sclerosis are very extensive throughout the spinal cord and medulla oblongata.

Sclerotic areas are found in the sacral region, and those in the posterior columns on both sides of the cord are symmetrical.

In the mid lumbar region the areas of sclerosis are remarkably symmetrical in the anterior, lateral and posterior columns. The areas in the lower, middle and upper thoracic regions are symmetrical.

The sclerosis in this case is somewhat different from that in many cases of multiple sclerosis, in that many of the degenerated areas are not sharply defined from the normal tissue, but shade off into it.

In the middle of the cervical swelling the sclerotic areas on the two sides of the cord are still nearly symmetrical.

Sclerotic areas are numerous in the medulla oblongata, and they are found also in the pons, cerebral peduncles, cerebral cortex and optic chiasm. Both the right and left optic nerves are almost completely degenerated except in certain parts of the periphery of each nerve.

The Marchi stain shows recent degeneration along the edges of some of the sclerotic areas. Perivascular round-cell infiltration in moderate intensity is found in the pia and within the spinal cord, but is pronounced in the pia of the optic chiasm and within the chiasm.

The nerve cells of the anterior horns in the lumbar and cervical regions stain well by the Nissl method. A brief abstract of each case is as follows:

Case 1.—The patient, a woman twenty-eight years old, had always been sickly and nervous. She noticed stiffness and weakness of the lower limbs in September, 1902. She complained of paresthesia in these limbs and had some disturbance of objective sensation. About Christmas, of 1902, she had difficulty

Fig. 2. Photograph of a section of the lumbar cord from Case 2, showing remarkable symmetry of the sclerotic areas in the anterior, lateral and posterior columns.

in holding the urine. Vision of the right eye appeared to be diminished. The gait was not striking when the eyes were open, but was ataxic when the eyes were closed. The patellar reflex was a little exaggerated on each side. Babinski's sign was present on each side. The upper limbs and head were not affected. Speech was not peculiar and nystagmus was not observed. The woman while in the hospital jumped from a third story window and died after an injury received

from the fall. She had a fracture of the first lumbar verte-
bra. Areas of sclerosis were found throughout the spinal
cord, and the right optic nerve appeared almost completely de-
generated.

Case 2.—This patient first came under the observation of one
of us (Dr. Spiller) in 1898, and had been under his care much of
the time since until the patient's death. In 1898 the man was
twenty-four years old. He had been exposed to wet and cold.
The notes made in 1898 state that he had been losing power in
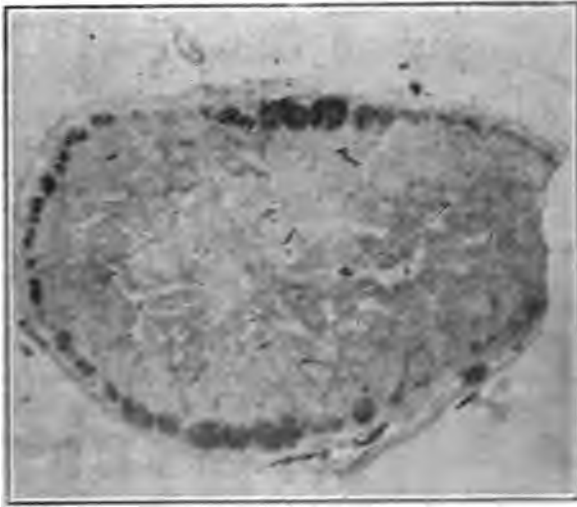his lower limbs for nine months, but had no loss of power in

Fig. 3. Photograph of one of the optic nerves in Case 2, showing a
sclerotic area implicating the transverse section of the nerve except at the
periphery.

the upper limbs and no pain anywhere. He had had difficulty
in holding the urine during a period of about two weeks. Sight
was poor. Gait was ataxic. Romberg's sign was present.
The patellar reflex was much exaggerated. Sensation was
normal everywhere. The upper limbs were ataxic. Slight
nystagmus was present.

In 1901 he was unable to walk at all. Beginning optic
atrophy was found in each eye. Speech was slow but not scan-
ning.

In July, 1903, intention tremor was observed in the upper limbs. He had incontinence of urine and feces. Tactile sensation was much impaired in the lower limbs and trunk. The temporal side of the disc in each eye was abnormally white, suggesting incipient atrophy.

Sclerotic areas were found throughout the cord, medulla oblongata, pons, cerebral peduncles, and in the white matter and cortex of the cerebrum. The areas in the spinal cord were remarkably symmetrical.

Flatau and Koelichen[9] say that the number of published cases in which multiple sclerosis caused the clinical appearance of transverse myelitis is not great. They refer to the cases of Pitres, Siemerling, and Nonne, and report a case in which the symptoms were flaccid paralysis of the lower limbs, incontinence of urine and feces, and decubitus; sensation was not disturbed. The upper limbs and cranial nerves were not implicated, and the patient did not have intention tremor, nystagmus, scanning speech or mental symptoms. An ophthalmoscopic examination was not made.

The first case that we report in this paper was suggestive of transverse myelitis, but it was supposed to be a case in which diffuse lesions were present in the lateral and posterior columns, and certain facts in the history suggested syphilis. The fall from a third story window during the time the case was being carefully studied caused symptoms that masked those originally present. An examination of the eyegrounds would probably have shown alteration of the right optic disc, and this examination would doubtless have been made if the accident referred to had not occurred soon after the patient entered the hospital.

The frequent implication of the optic nerves in multiple sclerosis was known to Charcot some thirty years ago. It has been mentioned repeatedly by Oppenheim, and more recently the subject has received attention from Bruns and Stölting and others. A person with sclerotic patches in the optic nerve may have little or no disturbance of vision, and the ophthalmoscopic examination may reveal an unsuspected condition, especially as the disease of the optic nerve may be

[9]Flatau and Koelichen. Deutsche Zeitschrift für Nervenheilkunde, Vol. 22, Nos. 3 and 4, p. 250.

multiple sclerosis, whether they are inflammatory or not, and they make the statement that most of the recent investigators favor the inflammatory theory. They refer to Ribbert, Cramer, Bikeles, Goldscheider, Balint, and others. Redlich, however, does not accept the inflammatory theory. Flatau and Koelichen, from a study of their case of multiple sclerosis and from their investigations of the literature, conclude that multiple sclerosis should be classed with disseminated myelitis. Strümpell, in a note at the end of their paper, makes the criticism that it would be better to regard their case as one of acute disseminated myelitis, instead of multiple sclerosis, and he insists on making a sharp distinction between the two diseases.

It is exceedingly difficult to determine the relation of multiple sclerosis to multiple myelitis. In the latter disease we do not find usually the areas of sclerosis sharply defined, at least to the naked eye, from the surrounding normal tissue. In our second case many areas of sclerosis shade off into the normal tissue, and at some places perivascular cellular infiltration is found, and yet this is unquestionably a typical case of multiple sclerosis. In our first case the perivascular cellular infiltration is distinct at certain places but it is impossible to establish a close relation between these and the sclerotic areas. This should be a suitable case for this purpose, as death occurred less than a year after the first definite symptoms of multiple sclerosis were manifest, and from a cause independent of this disease.

Redlich has called attention to the symmetry sometimes found in the areas of the two sides of the cord in multiple sclerosis. The symmetry throughout the spinal cord in our second case is extraordinary, and suggests a vascular origin or a defect in the development of the cord. We have never seen in any case of multiple sclerosis such symmetry extending throughout the cord, and yet we have at our command sections from many cases of multiple sclerosis. Fig. 3 shows the symmetrical areas on the two sides of the cord in the lumbar region.

UREMIC HEMIPLEGIA, WITH CHANGES IN THE NERVE CELLS OF THE BRAIN AND CORD, AND RECENT PRIMARY DEGENERATION OF ONE CENTRAL MOTOR TRACT.[1]

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Some of the effects of the disorder known as uremia upon the nervous system have been well recognized in recent years, although it is not so long ago that this was denied. Of the different manifestations of this disease none have been of more interest or have excited more study than the hemiplegia produced by the uremic condition. In spite of the large number of cases with necropsy, and of experiments upon lower animals, the cause of this disease still remains in doubt.

The usual findings at necropsy have been more or less edema of the brain substance and its membranes, and at times dilatation of the ventricles. A number of cases have been reported, however, where no edema was found. (Level, Chauffard and Lancereaux.) The edema may be symmetrical, it may be localized to the side of the brain opposite the hemiplegia (Pätsch. Charpentier), or it may be on the same side as the hemiplegia (Charpentier). A case was reported by Mann where in a right hemiplegia preceded by Jacksonian convulsions, the left ventricle was distended to about three times the size of the right ventricle.

It is hard to explain why a bilateral edema should produce a unilateral paralysis, or why the edema should produce paralysis at all. In the great number of cases of uremia which come to autopsy, in which there are no nervous symptoms, edema of the brain or membranes is a common finding.

The well known experiments of Raymond may perhaps throw some light upon the physiology of this condition. The left superior cervical ganglion was removed from a rabbit and

several days later the vessels at the hilum of the kidney were ligated, producing an artificial uremia. Convulsions occurred and were limited to the right side of the body. When the right ganglion was removed and the vessels tied, the convulsions were limited to the left side; or, the uremic disturbances showed themselves on the side governed by the cerebral hemisphere, the vessels of which had been paralyzed by the removal of the ganglion. At the necropsy, however, there was found a diffuse bilateral edema.

As a result of more recent research the theory that edema is the primary cause of uremic hemiplegia has been abandoned, and it is believed that definite organic changes in the central nervous system are the causes of this condition. Such changes, however, have not been heretofore described.

The cellular changes in the central nervous system in experimental uremia of dogs, have been studied by Acquisto and Pusateri. In the anterior horn cells of the spinal cord these investigators found loss of peripheral chromatic bodies, while the perinuclear bodies had undergone granular disintegration. In the cerebral cortex different stages of chromatolysis were noted. In some cells the peripheral chromatic bodies and the dendritic processes were normal, while in the perinuclear zones there was advanced chromatolysis. Other cells were homogeneous, and their nuclei dark and indistinct.

Sacerdotti and Ottolenghi also examined the central nervous system in dogs dying four to seven days after ligature of both ureters. By Golgi's method they demonstrated varicose atrophy of the dendrites, while the axis cylinder processes remained normal. The lesions were most marked in the cerebral cortex, where all the cells were affected, but were also abundant in the pes hippocampus. Nissl's stain failed to show the chromatolytic changes in the cortical cells described by Acquisto and Pusateri.

Donetti examined by Golgi's and Nissl's method the central nervous system of rabbits dying from uremia after bilateral nephrectomy. By Golgi's method he found varicose atrophy of dendrites with other less definite changes in the cortical and cerebellar cells. By Nissl's method there were no distinct alterations in the cortical cells. In the medulla and

the cord the nuclei of the large cells were very often eccentric,.
- the chromatic substance was reduced in amount, the bodies
were finely fragmented, and many cells contained vacuoles. He
does not believe that these lesions are characteristic of uremia..

Gabbi, as a result of bilateral tying of the ureters, found
in the cerebral cortex of guinea pigs and rabbits, in most of
the cells a perinuclear chromatolytic process with a homo-
geneous condition of the nucleus. In the medulla there were
examples of peripheral chromatolysis. With Golgi's method
varicose atrophy of the nerve cells was found. Some of the
cells in the anterior horns were deformed.

Ewing studied microscopically the nerve cells of the brain
and cord of six cases of uremia. In none of his cases were
there any accompanying paralysis of the upper and lower
limbs of either side, except in one case where one arm was
paralyzed. He came to the following conclusions: "Uremia
as it occurs in the human subject is associated with rather
marked changes in the chromatic substance of the nerve cells,
but these changes are very irregular in character and distribu-
tion. As a rule the spinal cells are but little changed in un-
complicated cases. The lesions are most marked in the medul-
lary nuclei, especially in the nuclei of the tenth nerve and
above, as well as in the deeper cells throughout the medulla.
Here nearly every variety of chromatolysis may be observed,
excepting very advanced or complete bleaching of the cells,
which is rare.

"The cortical cells are usually better preserved than might
be expected from the very marked cerebral symptoms of fatal
and prolonged uremia. In the case dying with severe convul-
sions the cortical as well as the medullary lesions were most
marked.

"The condition of Purkinje's cells was very uniform in the
cases examined, the chromatic bodies of these cells being very
irregular in size and shape, and considerably deficient in
number.

"The effects of the pial edema could not be distinctly
traced in the cortical cells.

"No distinct or uniform nuclear changes were detected
in these cases, although the nuclei were often abnormal in ap-
pearance. The achromatic substance of the cortical archyo-

tient talks freely and it is evident that she is worried by some private affair. The bowels and bladder are paralyzed. She has complete paralysis of the lower limbs and cannot even move the toes. The patellar reflex is lost on each side. There is no ankle clonus and Babinski's sign is not obtained. The level at which sensation for touch is preserved can not be accurately determined because of the patient's inability to fix her attention on the examination. A pin prick is not felt at all in the left lower limb, and very imperfectly in the right lower limb; but is felt over the whole of the abdomen. The head and upper limbs except where the fracture has occurred, are not affected.

An X-ray examination made September 22 seemed to show an injury of the second and third lumbar vertebræ.

The patient had fever about 101°, varying from 1½ to 2° daily, pulse 116 to 132, respiration 24 to 28. She became gradually weaker and died October 3.

The necropsy was made by Dr. Randolph. His notes abbreviated are as follows: Extravasation of blood is found over the lower anterior surface of the sternum, and especially over the anterior surface of the spinal column. A subdural hemorrhage is present over both occipital lobes, but the skull is not fractured. The first lumbar vertebra is fractured, and the body of this vertebra is displaced backward. At the seat of fracture the spinal cord is softened and disorganized, but above this level the cord appears to be normal.

The microscopical examination gives the following results: The spinal cord below the third lumbar segment is softened as a result of the fracture of the first lumbar vertebra. Sections from the lower part of the second lumbar segment or upper part of the third lumbar segment show several areas of sclerosis, and the area of the left crossed pyramidal tract contains fewer nerve fibers than in normal sections, and presents the appearance of secondary degeneration. Symmetrical areas of sclerosis are found in the anterior and posterior columns. In sections stained by hemalum and acid fuchsine a slight round cell infiltration is seen about some of the vessels in the spinal cord and in some parts of the pia. The nerve cells of the anterior horns stained by the acid fuchsine are much degenerated. They are swollen and their nuclei are eccentric. This alteration is probably the result of the fracture. The Nissl method could not be employed. Sections from about the same level stained by the Marchi method show much recent degeneration widely distributed. Numerous bundles of degenerated fibers coming from the posterior roots are seen entering the left posterior horn. Similar bundles are not found in the right posterior horn, because at this level the right posterior horn was implicated in a sclerotic

after the onset of the paralysis. The temperature varied between 97° and 98° F. during her illness. The urine examination was undoubtedly made, but the record has been unfortunately lost from the history sheet.

The necropsy was performed by Dr. C. H. Bunting, who made the following notes regarding the patient's kidneys: "The kidneys are small, the capsule is thickened, leaving a granular, roughened surface when stripped. On section, the cortex is narrow, the striæ irregular and the glomeruli are injected and prominent."

The pathological diagnosis was:

Arteriosclerosis, chronic diffuse nephritis, cardiac hypertrophy and dilatation, chronic interstitial pleuritis and enterocolitis.

There was no note made of edema of the membranes of the brain or cord. The ventricles were opened and the specimens put into Orth's fluid. Horizontal sections made show no gross lesions, and a careful examination showed no small lacunæ, nor areas of softening as described by Marie.

Microscopically the changes in the nerve cells as stained by the thionin stain are as follows:

Lumbar region.—The cells here are similar to those in the cervical region. The cells of the column of Clarke are much degenerated. The chromophilic elements in many of the cells have entirely disappeared, and are replaced by a mass of fine granular yellow pigment filling up the whole cell body. In most of the cells the nuclei are at the periphery.

Cervical region.—The cells of the anterior horns are intensely pigmented, which is not remarkable considering the age of the person, which was seventy-one years. Some of the cells are probably atrophied, the nuclei are not displaced and the alteration in the cells is slight.

Paracentral lobule.—The Betz cells of the left paracentral lobule are intensely pigmented. In some of the cells the pigment fills the whole cell body, and in these cells the nucleus cannot be observed. The Betz cells of the right paracentral lobule are similar to those in the left paracentral lobule, but the alteration is more intense than in the left. In some cells chromatolysis and peripheral displacement of the nucleus without an excessive amount of pigment, are found.

Cerebellum.—Many of the cells of Purkinje are swollen, in some the nucleus is eccentric and the chromophilic elements are more or less broken up. Pigmentation of these cells is not pronounced.

Medulla.—The cells of the nucleus ambiguus of each side are in condition, however here and there a much altered

cell is found. In these cells the nucleus is displaced to the periphery and the chromophilic elements are disintegrated. Nerve cells from the frontal, temporal and occipital regions do not show any distinct pathological changes.

The Weigert hematoxylin and acid fuchsine stains show no changes in the spinal cord.

In the lumber region degeneration as shown by the Marchi method is present in the left crossed pyramidal tract. It is slight, but unmistakable. In the cervical region the degeneration in the crossed pyramidal tract of the left side is greater than that in the lumbar region. It is moderate in degree, and is such as would be found in a primary degeneration of short duration. It is, however, unmistakable and is confined to the left crossed pyramidal tract. There is much less intense degeneration in the right direct pyramidal tract.

In the right pyramid there is still degeneration by the Marchi method, but it is much less intense than in the left crossed pyramidal tract in the cervical region. Degeneration by the Marchi method is still shown in the middle portion of the foot of the right cerebral peduncle. It is much less intense than in the left crossed pyramidal tract of the cervical region.

In the right internal capsule by the Marchi method a number of degenerated fibers can be seen, but these are so few in number that it is impossible to state definitely that there is degeneration of the motor fibers.

The Betz cells of the paracentral lobule show no change by the Marchi method.

Case II. W. E., seventy-seven years old, was admitted to the Philadelphia Hospital August 31, 1903, service of Dr. Wm. G. Spiller. The notes made by Dr. Spiller on the same day are as follows: "The patient is completely unconscious. The left palpebral fissure is larger than the right. The left pupil is larger than the right. The lower distribution of the left seventh nerve is paralyzed. The man makes no effort to draw up either side of the mouth when he is stuck with a pin. The left upper limb is completely paralyzed and is spastic at the elbow. The biceps, triceps and wrist reflexes are exaggerated on both sides. Both lower limbs are somewhat spastic. The left lower limb is almost completely paralyzed. When stuck with a pin he moves the left toes slightly. Both patellar jerk are present, but diminished. The right upper and lower lim's are moved voluntarily, and also when he is stuck with a pi but

The patient's temperature on admission was 101.4° F par- was normal when he died four days after the onset of st. alysis. Here also the urine examination report was o made

The necropsy was performed by Dr. John Funk,

the following notes: "The kidneys are small and show fetal lobulation. The capsule strips with difficulty, revealing a granular area. The cortex is narrow, and is diffused into the medullary portion, which is inconspicuous. The pyramids are visible only here and there. The pelvis contains considerable fat." The other pathological diagnoses were: Fibroid myocarditis, chronic endarteritis and atheroma of the vessels at the base of the brain.

Here also there was no note made of the edema of the cerebral or spinal membranes. Horizontal sections of the brain show no gross lesions.

There is no degeneration of either crossed pyramidal tract by the Weigert hematoxylin, acid fuchsine or Marchi methods.

The nerve cells of the anterior horns of the lumbar region are about normal and not nearly so much pigmented as one might expect in a person so old as seventy-seven years. Chromatolysis is seen in some of these cells, but is not intense.

The nerve cells of the anterior horns of the cervical region are much like those in the lumbar region, except that they are more pigmented.

Many of the Betz cells of the left paracentral lobule are nearly normal, but some are in a state of chromatolysis.

The changes in the cells of the Purkinje are slight. Some of the nuclei are displaced and there is a slight chromatolysis.

The cells of the nucleus ambiguus are in a very good condition, many of them are deeply pigmented and here and there some cells are much altered.

We have here, therefore, two cases of hemiplegia of uremic origin where macroscopically no gross lesion was found. In the first case the paralysis lasted 14 days before death, while in the second case the man lived only 4 days after the onset of the hemiplegia. The changes in the nerve cells as shown in the Betz cells of the paracentral lobule in the first case, while intense on both sides, were distinctly more so on the side opposite the paralysis. The alterations in these cells were not uniform, except that an intense yellow pigmentation was present in nearly all the nerve cells. The cells of the anterior horns of the spinal cord were not much altered, but here too the yellow pigment was abundant.

The degeneration of the motor fibers as shown by the Marchi method was traced from the lumbar region of the spinal cord to the internal capsule.

The degeneration, while not intense, was unmistakable, and was of such a character as would be expected in a primary degeneration of recent origin, in this case fourteen days. It was most marked in the crossed pyramidal tract of the cervical region, and became less intense in the medulla, and cerebral peduncle, and in the internal capsule it was hard to find traces of it.

The degeneration was essentially a primary degeneration, i.e., not due to any destruction of the fibers in a limited part of their course, and was in association with the changes in the nerve cells in the motor cortex. That the degeneration was found only in the motor fibers of one side, is explained by the more intense changes in the cortical cells belonging to these fibers, and it is a fair presumption that had the uremic poison or poisons had time to act further, there would have been also a primary degeneration of the motor fibers of the opposite side.

I hardly expected to find recent degeneration by the Marchi method in the second case, for here the hemiplegia was only of four days' duration. Changes were found, however, in the nerve cells of the cortex, cerebellum, medulla and the anterior horns of the spinal cord, but these were not as intense as in the cells of the corresponding regions of the first case.

It is hard to explain why the alterations in the nerve cells were more intense on one side of the cortex, except by the theory of *locus minoris resistantiæ*, which is hardly an adequate explanation.

As a result of the study of these cases we must come to the conclusion that a toxic process like uremia may produce definite changes in the nerve cells of the brain and spinal cord, and that these changes may be more marked in the motor cells of the cortex, and in association with these alterations in the nerve cells of the motor cortex we may have a primary degeneration of the motor fibers, provided the duration of the hemiplegia is long enough.

The effects of other toxic processes upon the central nervous system have been carefully studied, and changes in the nerve cells of the brain and cord have been repeatedly ob-

served. These alterations, however, have not been uniform or characteristic, and it may be that the findings in the first case may have an important bearing on the future study of these conditions.

I am indebted to Dr. Charles S. Potts for the material and notes of the first case, and to Dr. Wm. G. Spiller for the material of the second case, and for his assistance.

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A CASE OF SPLENOMEGALY WITH BLOOD CHANGES AND SYMPTOMS RESEMBLING THOSE OF BANTI'S DISEASE, APPARENTLY DUE TO MALARIA.[1]

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AFTER Osler's[2] careful studies of conditions resembling the one about to be described, and the work of Lippy, Wentworth, and others, cited by him, an historical or pathological discussion to which no new fact could be contributed would be out of place. As the patient whose case I wish to put on record is living and apparently improving, and as the affection with which she suffers is usually chronic, there is no reason to wait for an autopsy (which we are bound to hope will long be postponed) before reporting the clinical observation. Moreover, single cases may be of importance in the final classification of a subject as yet very obscure.

As Osler has pointed out, and as we can all recall as we pass in review our personal observation, either of cases carefully studied and recorded, or of cases vaguely recalled of which no scientific record was made, the combination of enlarged spleen, enlarged liver and blood changes of an anæmic or chlorotic type, is not exceptional, while combinations of two of these three factors are not infrequent. There seems, however, to be among the motley groups in which these pathological factors are commingled in various sequence and degree one which may be separated as possessing certain additional characteristic symptoms and of which Lichty[3]

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[1] Paper read and patient presented before the College of Physicians of Philadelphia, March 2, 1904.

[2] THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, 1900, vol. cxix. ; Transactions of the Association of American Physicians, 1902, vol. xvii. pp. 428, 456.

[3] Journal of the American Medical Association, February 20, 1904, p. 528. Eshner's case is not included in this list, and probably others might be added.

in a recent literary study could find record of only 34 cases
sufficiently described.   To this group of cases Osler would affix
and restrict the designation *anæmia splenica*, and even *anæmia
splenica chronica*.   Of its earliest stages little is, or from its nature is
likely to be, known; of its intermediate stages much has been
written; and to its late stages the name of Banti's disease has been
given.   If we accept Osler's definition in its entirety, the case to be
reported does not fall within the group he has erected; for he insists
on an unknown etiology, especially excluding malaria and syphilis.
On the other hand, while there is no diminution of leukocytes, the
enormous size of the spleen, the peculiar pigmentation of the skin,
the pulmonary, nasal, and gastrointestinal hemorrhages, the appa-
rently secondary character of the hepatic involvement, the diminu-
tion of erythrocytes, and the low hæmoglobin content of the blood,
tally precisely with Osler's description.
  The blood was carefully studied by competent observers without
finding parasites until—following the administration of quinine—
it was again examined by Dr. Rosenberger, who succeeded in
demonstrating an organism of a type not common, at least in the
United States. Several interesting diagnostic queries thus arise. In
the absence of the discovery of the organism, would the case have
come into Osler's group, and is it now to be excluded? Is it possible
that in any large number of the recorded cases examination at an
earlier stage—for our case is probably of not more than two years'
duration—would have revealed malarial parasites? Is it possible
that in recorded cases in which the parasite is said to have been ab-
sent, and in which no distinct history of malaria was given, adminis-
tration of a sufficiently active salt of quinine would have driven para-
sites into the peripheral circulation, where they could have been
found?
  I can have no definite answer to propose to these queries, and I
have not studied all the recorded cases with sufficient critical minute-
ness to hazard a guess.   I am satisfied that in very many cases, cer-
tainly in those in which Osler reports its absence, malaria was not
present. But are we to be restricted entirely to an etiological diagnosis
in this obscure condition, as we are properly restricting ourselves
wherever possible? Are we at all sure that all the accepted cases have
one and the same etiology? If a multiple etiology be permissible, why
draw the line at malaria? except it be on the same principle as
Dickens's barber, who remarked to a man whom he had declined to
shave, that "the line 'ad to be drawn somewhere, and he drew it at
coal 'eavers." In Lichty's tables the line is not drawn at the humble
plasmodium --- --   at less respectable germs. He includes 7 cases

of malaria and 2 of syphilis. I quote in summary the other features of his analysis. Twenty-six cases were males, 8 females; the average age was thirty-six years. Melanoderma was present in 17 cases. Splenic enlargement was the most prominent feature in all, and anæmia the next. Hemorrhage occurred in 24. Hæmoglobin averaged 47 per cent.; the red cells, 3,293,000; white cells, 5594. Excluding 2 cases in which there was leukocytosis, the leukocytes averaged 4381. The liver was enlarged in 16 cases, small in 1. Ascites was present in 7, swelling of feet and legs in 9, glandular enlargement in 3, gastrointestinal symptoms in 8, and cardiac murmurs, generally hæmic, in 11. In only 2 cases was there albumin, a trace, while the 1 reported by Lichty had considerable at times, as well as pus and casts. Of 25 cases treated medically, only 5 recovered, 12 were improved, and 7 died, hemorrhage having been the commonest cause. Operation was performed in 8 cases, with 5 recoveries and 3 deaths.

I may also note at this point that even in Osler's own series of 18 cases, malaria had been present in 5. Osler excludes it as a factor in the splenic anæmia, however, on the ground of time. In 3 of the patients (aged forty years, fifty-six years, and thirty years) the infection was in childhood; in only 2 was it in adult life—in 1, twelve years, in the other eighteen years before the onset of the present illness. In view of the tendency of the malarial organism to lie dormant for long periods, possibly in the spleen, possibly in the bone-marrow, possibly elsewhere, in an unknown stage, and over many years—more than twenty years in 1 of my cases of chronic, recurrent malaria—can we be sure that this admitted infection was devoid of moment in the cases reported? It is true that in cases of prolonged malarial infection (and such was the fact in the instance I have referred to) paroxysms of various kinds are usually manifested with some kind of periodicity—recurring annually or semi-annually, as a rule—and that well-timed, persistent search in the peripheral blood, especially if the patient be placed under the influence of quinine, iron, or residence at an altitude, will eventually find the organism. Nevertheless, in my case of long-standing malarial infection, there were many successive months when organisms were invisible to almost daily search in the peripheral blood, and others have had similar experience. Thus the possibility of the existence of malarial infection, despite the failure of good observers to discover the organisms, must be admitted; and with this admission, until a definite etiology is established for the anæmia splenica of Osler, cases conforming clinically to the type may usefully be studied together.

Osler's definition is: "A chronic affection, probably an intoxication of unknown origin, characterized by a progressive enlargement of the spleen, which cannot be correlated with any known cause, as malaria, leukæmia, syphilis, cirrhosis of the liver, etc. (primary splenomegaly); anæmia of a secondary or chlorotic type (leukopenia), a marked tendency to hemorrhage, particularly from the stomach, and in many cases a terminal stage with cirrhosis of the liver, jaundice, and ascites (Banti's disease)."

The case history of my patient, condensed from Dr. Slifer's ward notes, may be given briefly:

Summary. History of chills and fever in Italy two and a half years ago. Irregular fever, subsiding in hospital (acute bronchopneumonia); greatly enlarged spleen and liver; melanoderma; hæmic murmur; nasal, pulmonary, and gastrointestinal hemorrhages; marked anæmia with low hæmoglobin content; variable leukocyte count; malarial organisms found with difficulty and only after the administration of quinine.

Maria B., the patient herewith exhibited, is said to be fourteen years of age, but appears to be older. Although well developed and of Italian race, she has not yet menstruated. As she cannot speak English and an intelligent interpreter was lacking, little could be gleaned in the way of history or subjective symptoms when she was admitted to the Philadelphia General Hospital on December 12, 1903. She had at that time a slight fever, with pain in the chest and cough, accompanied with expectoration of blood-tinged mucus; and physical examination revealed signs—scattered areas of dulness, harsh breathing, subcrepitant rales, and friction sounds—that warranted a diagnosis of (influenzal?) bronchopneumonia, with concomitant pleurisy. The Widal reaction was not manifested in the blood or the diazo reaction in the urine, tubercle bacilli were absent from the sputum, which contained pneumococci, staphylococci, and streptococci. Enlargement of the spleen and enlargement of the liver were noted, as well as the presence of a faint systolic murmur at both base and apex of the heart. Malarial organisms were looked for and not found. The course toward recovery (of the acute attack) was uneventful. As cough, pain, and fever subsided, attention was given to the chronic conditions, and the outlines of spleen and liver carefully delimited by palpation and percussion. The lower border of the spleen was found to extend two inches to the right of the median line and three inches below the umbilicus. Thence the right border ran in a diagonal line toward the costal margin, which it cut one and a half inches to the right of the left mammillary line. Above the costal border percussion flat-

ness extended to the fifth interspace in the mammillary line, to the sixth in the midaxillary line, and in the posterior axillary line to the lower border of the scapula in rest. The upper posterior corner of the splenic flatness was on the line of the upper border of the sixth dorsal vertebra, one inch to the left of the middle line of the back; thence the line extended diagonally forward to the posterior axillary line, which it cut at the margin of the ribs, there merging into the posterior border of the abdominal mass outlined by palpation. The liver was found by percussion to reach to the eighth dorsal spine superiorly, inferiorly to the twelfth. Anteriorly the liver flatness in the mammillary line reached from the upper border of the fifth rib to a line one and a half inches below the costal margin. By palpation the liver was found to extend across the epigastrium as far as the right or anterior border of the spleen, when it apparently sank below the latter organ, which could be grasped separately. The abdomen as a whole was somewhat distended, the superficial veins well marked; there was no ascites; the conjunctivæ were slightly icteroid. The patient, as may be seen, is of dark skin, but has a deep red—not cyanotic—flush on both cheeks; the lips are of a good red color. Small pigmented areas are found over the entire body— the face, the neck, the thorax, the back, the arms, the abdomen, the legs, the soles of the feet. They vary in size from a pinhead to an irregular oval, whose long diameter may be one-half inch, and in hue from light yellow almost to black. The prevailing shade is a deep brown. On admission a history of constipation was given, but this symptom was absent while in the hospital; the bowel movements on admission being, indeed, liquid and of a light color.

January 3, 1904. The patient had a slight hemorrhage from the nose, which was followed by hæmoptysis, cough, and expectoration of blood, mostly bright red and frothy, though some clots were found. She did not complain of pain. Following the hemorrhage the pulse was rapid and rather weak and the area of splenic dulness seemed to be perhaps slightly decreased. Five days later the patient coughed up during the night about eight ounces of blood of a bright-red color, with a few small clots. In the morning epistaxis occurred, and the following night there was vomiting of about three ounces of partially clotted blood.

On January 10th the patient passed by bowel about six ounces of bloody fluid, described in the ward notes as "mostly pure blood, liquid and dark in color."

Examinations of the blood from the finger and of the urine were made from time to time, some of which may be quoted.

December 19, 1903. The urine was amber in color; acid in reaction; specific gravity 1016; sugar absent; trace of albumin present; no casts found.

January 21, 1904. The urine was reddish brown in color; acid in reaction; specific gravity 1014; sugar absent; albumen absent; no blood; no casts.

December 12, 1903. Hæmoglobin, 59 per cent.; red blood cells, 1,890,000; white blood cells, 23,450 (acute bronchopneumonia in active progress). Differential count of 200 leukocytes : small lymphocytes, 13.5 per cent.; large lymphocytes, 8.5 per cent.; polymorphonuclears, 77.5 per cent.; basophile, 0.5 per cent. An occasional megaloblast was observed; no malarial parasites demonstrable (Drs. Calhoun, J. C. Da Costa, Jr.).

January 1, 1904. Hæmoglobin 63 per cent.; red blood cells, 2,290,000; white blood cells, 14,000 (acute bronchopneumonia subsiding); no malarial parasites (Dr. J. C. Da Costa, Jr.). Widal's reaction, using dilution of 1 : 40, was negative in thirty minutes (Dr. Calhoun).

Failing to find malarial organisms it was decided, nevertheless, to begin treatment with the double hydrochlorate of quinine and urea, with the hope that this might perhaps disturb existing conditions in such a way that parasites might be found peripherally in accordance with an old clinical observation that in cases of latent malaria removal to a mountainous district or the administration and withdrawal of quinine would in many cases cause the development of frank paroxysms of ague.[1] Whether for this reason or for some other, Dr. Rosenberger's observation now detected the malarial organism.

14th. Hæmoglobin, 34 per cent. (following hemorrhage); red blood cells, 1,280,000; white blood cells, 10,400; nucleated reds present (Dr. Calhoun). Differential count of whites: polynuclear, 90 per cent.; lymphocytes, 6.5 per cent.; hyaline, 1.5; eosinophiles, 2 per cent.; microcytes, macrocytes, poikilocytes present; also a few macroblasts, normoblasts, and phantom reds; parasites present (Dr. Rosenberger).

22d. Hæmoglobin, 46 per cent.; red blood cells, 2,640,000; white blood cells, 7420 (after subsidence of acute bronchopnenmonia); parasites present.

26th. Hæmoglobin, 48 per cent.; red blood cells, 2,690,000; white blood cells, 7800; nucleated reds present; parasites present (Dr. Calhoun).

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[1] I first read of this fact in Archibald Billing's First Principles of Medicine, London, 1888, *p. 218;* sixth edition, 1868, p. 433.

The further description of the blood will be found in Dr. Rosen-
berger's report herewith appended.

Quinine having been withdrawn, treatment with arsenic was be-
gun, Fowler's solution being pushed apparently to the point of toler-
ance as manifested by œdema of the eyelids and face. The dose, how-
ever, at which this symptom occurred was very small, about 10
minims three times daily. The arsenic was intermitted for a week,
and then resumed, when after a few days of small doses the recur-
rence of œdema was noticed. Arsenic was then withdrawn entirely
and remembering an old observation by J. M. Da Costa on the
effect of ergot in diminishing malarial spleens, this drug was
given in ascending doses, beginning with ten drops of the fluid
extract and reaching thirty drops three times daily. Œdema, how-
ever, continued to recur and disappear during the administration
of ergot, and it was then concluded that this was a phenomenon
of the case itself, having no relation to the administration of drugs
To test the point the ergot was suspended and arsenic again given,
the œdema continuing to appear and disappear during the per-
sistent administration of arsenic and during the withdrawal of
arsenic. As the hemorrhages ceased and the patient began to
gain in strength an x-ray picture was made. The patient was not
at all incommoded by the examination, and the thought was sug-
gested of attempting to use the therapeutic influence of the rays.
She was accordingly treated twice weekly by Dr. Johnson with
Roentgen radiations from a low-vacuum tube at a distance of twelve
inches from the spleen; the period of exposure at first being five
minutes, gradually increased to ten minutes. In addition, our
object. being not a therapeutic study, but an attempt to help
the patient if possible, treatment with quinine and urea hydro-
chlorate was resumed, 15 grains being given by hypodermic injec-
tion daily, with instruction to cease when symptoms of cinchonism
should be manifested. These have not appeared up to date, but
the injections have nevertheless been discontinued on account of
the local pain caused, and the drug is given by the mouth instead.
In this connection W. J. Morton's observations on the therapeutic
value of "internal fluorescence" through conjoint use with Roent-
genism of quinine, fluorescin, æsculin, etc., are to be remembered.

Whether from rest, from nutrition, from x-rays, from ergot, from
arsenic, from quinine, or from all these combined, or despite them,
a great improvement has taken place in the condition of the patient.
She is bright and cheerful; hemorrhages have not recurred since
the date last noted, and the spleen and liver have diminished in size
to the extent shown by the markings herewith. exhibited, by which

it will be seen, to be brief, that the outer border of the spleen has receded about two inches all around from the previous abdominal markings and that the liver extends but seven-eighths of an inch below the border of the ribs instead of one and a half inch as previously. Unfortunately our therapeutic observation cannot be continued, as the Immigration Commissioners claim the girl, as a public charge, for return to Italy.

The report of the blood examinations by Dr. Rosenberger, and his comments thereon, follow:

January 14*th.* The blood was thin, watery, pale, and of retarded coagulability. In the fresh state the erythrocytes were irregular in size and shape; microcytes, macrocytes, poikilocytes, nucleated forms (normoblasts and macroblasts) and a few pale or indistinct cells were present. There was no apparent increase of white cells, and the polymorphonuclear form was the most prominent.

In the preparation were a number of small bodies, some circular, some slightly oval. Some of these bodies were slightly granular, though most were hyaline. A few contained small fine pigment granules in an amotile state; some were intracellular, while the greater number were extracellular. Hæmoglobin, 34 per cent. (Dare's hæmoglobinometer); erythrocytes, 1,280,000; leukocytes, 10,400 (Dr. Calhoun).

Spreads were stained with Ehrlich's triple mixture, some with Wright's, and others with Jenner's stain. A differential count of the leukocytes resulted as follows: polymorphonuclear, 90 per cent.; lymphocytes, 6.5 per cent.; hyaline cells, 1.5 per cent.; eosinophiles, 2 per cent.

In these stained preparations the bodies above referred to were plainly visible, mostly extracellular and possessing a finely granular, faintly reticulated appearance. Ross' method was also used to demonstrate the parasites with success. Suggestively crescentic-shaped bodies were present.
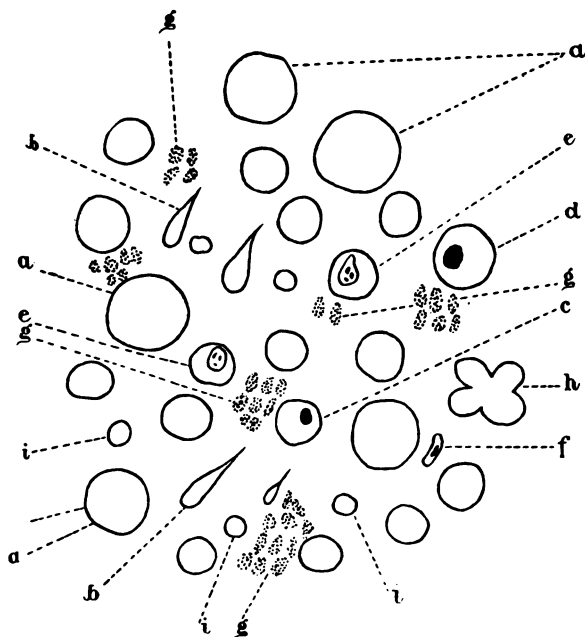
20*th.* At this examination the blood presented the same interesting features.

In fresh preparations were the small hyaline bodies as noted in the first specimen, several of which were slightly motile.

There were few poikilocytes; an occasional nucleated red cell (normoblast) and a few phantom cells were still present, as well as the condition of microcytosis and macrocytosis. In spreads prepared with Wright's stain the bodies were evident; in some there was a background or matrix staining an extremely delicate or pale blue. Hæmoglobin, 45 per cent. (Dare's hæmoglobinometer); erythro-

cytes, 2,640,000; leukocytes, 7420 (Dr. Calhoun). Differential count of leukocytes was: polymorphonuclear, 77.5 per cent.; lymphocytes, 14 per cent.; hyaline cells, 5.5 per cent.; eosinophiles, 2.5 per cent.; basophiles, 0.5 per cent.

In one or two hyaline cells an apparent nucleolus was situated eccentrically. Only two normoblasts were found in each of several spreads examined.

a. Megalocytes. b. Poikilocytes. c. Normoblasts. d. Megaloblasts. e. Intracellular parasites. f. Extracellular parasite suggestively crescentic. g. Blood platelets. h. Deformed erythrocyte. i. Microcytes.

23d. Spreads of the blood were made at twelve o'clock (noon), 2 P.M., 4 P.M., and 6 P.M. In the fresh condition a few spherical hyaline, sluggish bodies were seen in each preparation. There seemed to be no increase in number in the succeeding examinations.

27th. The blood obtained upon this date differed in no respect from that taken four days previously. The bodies were clearly hyaline in the fresh blood, and in the stained spreads a few were seen intracellularly and faintly pigmented.

The irregularity in the size of the erythrocytes still persisted, while an occasional normoblast was seen. Apparent vacuolation of the red cells was also observed. Hæmoglobin, 47 per cent. (Dare's hæmoglobinometer); erythrocytes, 2,240,000; leukocytes, 6600. Differential count of the leukocytes was: polymorphonuclear, 66 per cent.; lymphocytes, 25.5 per cent.; hyaline cells, 6.5 per cent.; eosinophiles, 2 per cent. None of the leukocytes contained pigment granules.

30th. Spreads made upon this date contained the same bodies in about the same condition as in the previous examinations, mostly oval and extracellular, but a few were intracellular. Microcytes and macrocytes, phantom cells, apparently vacuolated erythrocytes, and an occasional normoblast were demonstrable. A few erythrocytes were seen taking the form of a four-leafed clover.

Some brief comment may be made upon the findings as thus detailed and as exhibited in the slides now under the microscopes.

Our blood picture may be summarized as follows: hæmoglobin, below 50 per cent.; erythrocytes, averaging 2,000,000; leukocytes, averaging between 7000 and 8000; poikilocytosis, microcytosis, and macrocytosis, presence of normoblasts, a few megaloblasts, phantom cells, and the appearance of small, oval, circular intracellular and extracellular bodies, which, in a small number, are very lightly pigmented.

In most respects the blood changes here recorded resemble those of Banti's disease or splenic anæmia, the chief differences being in the small number of nucleated reds found in this case and the absence of marked leukopenia. The low percentage of hæmoglobin, the small number of erythrocytes, the presence of poikilocytes, microcytes, macrocytes and phantom cells, all point to this malady. Also the hæmatemesis and enterorrhagia are symptoms which clinically suggested Banti's disease. These latter conditions may have arisen from pressure bringing about congestion as a result of enlargement of the spleen. It is possible that we may be dealing with both maladies—*i. e.*, Banti's disease and malaria.

In morphology, the small bodies while not conforming to a typical malarial parasite, may represent, as Manson says, "moribund or fragmented forms." (These are mechanically freed parasites expressed from blood corpuscles by the compression to which the blood is subjected between slip and cover glasses. Frequently, these artificially freed parasites are broken into small fragments, and becoming free in the liquor sanguinis, assume a spherical or disk-like form. The protoplasm becoming diffluent, the pigment is resolved into a number of minute dust-like particles possessing

THE PRESENCE OF TUBERCLE BACILLI IN THE URINE OF PATIENTS SUFFERING WITH PULMONARY TUBERCULOSIS.

BY

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In examination of the urine for tubercle bacilli in 25 cases, the residual urine was obtained by means of a sterile catheter. In no case was tuberculosis of the genitourinary tract diagnosed or suspected, and as can be seen in the accompanying table, only pulmonary tuberculosis was present, the sputum always showing tubercle bacilli. Generally, the urine was perfectly clear in color, light, or of a dark amber color. Upon standing a long time a deposit formed in a few, and this was mostly made up of urates. The technic employed was as follows: The urine was centrifugalized and a sediment obtained. The supernatant fluid was poured off, the tube filled with water, shaken and again centrifugalized. This method was first proposed by Trevithick,[1] who claims that it is attended with the best results. The urinary salts prevent the bacilli and even pus cells from adhering to the cover slip, and by washing with water, this process is facilitated.

Spreads were then made from the sediment and dried carefully over the flame, taking great care not to burn or scorch the preparation. Carbol fuchsin was next applied, and allowed to remain 5 to 15 minutes. This was washed off with water, and a mixture of sweet spirits of niter (two parts) and a saturated alcoholic solution of malachite green (one part) was next applied for one or two minutes. This mixture was washed off with water, and if the preparation was green in color, it was dried and mounted in balsam. If not green, the solution was again applied and reapplied until this color was obtained.

After a very careful examination, few isolated tubercle bacilli were found in three cases. No clumps or groups of bacilli were observed, as are usually seen in cases of tuberculous cystitis, nephritis, etc.

Intraperitoneal inoculations were made in guineapigs, and 2 cc. of the sedimented urine was used. As a result of the inoculations three animals died, and in one of these (No. 17) no tubercle bacilli had been found in the urine of the individual. The surviving animals were kept under observation for three months, then killed, and in not one of them was there any evidence of a tuberculous process.

Herewith is a table of the patients examined.

Marmorek[2] recommends for the detection of tubercle bacilli in fluids, injecting the fluid into a guineapig and then inoculating with a small dose of tuberculin, 3 cc., in from 15 to 20 minutes.

The temperature rises immediately, and by five hours reaches 40° C. or higher. The interval between the administration of the bacilli and tuberculin should be not less than 15 minutes nor more than 90 minutes. He claims that the reaction is due to the action between the tubercle bacilli and the tuberculin. The latter, as it comes in contact with the bacilli, causes them to secrete a toxin which gives rise to the fever and other symptoms which make up the tuberculin reaction.

Nattan-Larrier[3] obtained the best results by allowing four to six days to elapse between the injection of the suspected fluid and tuberculin. He used pregnant guineapigs and injected into the fibrous tissue around the mammary gland.

Fournier and Beaume[4] claim that the tubercle bacillus was present in the urine in all cases of acute tuberculosis that they examined. They urge that finding the organism in the urine possesses diagnostic value and that the kidney need not be tuberculous.

Flick and Walsh,[5] in considering the presence of tubercle bacilli in the urine, in 60 cases of clinical tuberculosis taken more or less at random, found that 44 showed the presence of this organism. Forty of these were undoubted cases of at least pulmonary tuberculosis, and 4 were suspected on account of general clinical symptoms

	Name.	Sex.	Lesion.	Sputum.	Urine.	Inoculation results in guineapigs.
1	J. McQ...	M.	Dulness at left apex, cough, night sweats.	Positive	Positive	At end of two months the animal died with tuberculosis of the lungs, liver and peritoneum.
2	M. R......	F.	Dulness at right apex, expectoration profuse.	"	Negative	Survived.
3	A. H........	M.	Dulness both apices, night sweats and expectoration.	"	"	Survived.
4	M. S.......	F.	Decreased resonance on right side, pains in chest.	"	Positive	Survived.
5	M. L........	F.	Decreased resonance at apices, emaciation.	"	Negative	Survived.
6	M. M......	F.	Impaired resonance of left apex and upper lobe of right lung	"	"	Survived.
7	M. C........	F.	Dulness over left chest, resonance increased and emaciation.	"	"	Survived.
8	M. McC...	M.	Dulness of both apices to middle of scapulae	"	"	Survived.
9	Z.............	M.	Dulness on left side down to fourth rib.	"	Positive	Emaciation and death in four weeks. Tubercles in peritoneum, spleen, liver, lungs and upon posterior aspect of sterr

Name.	Sex.	Lesion.	Sputum.	Urine.	Inoculation results in guineapigs.
10 J. Eb......	M.	Dulness of entire left side and right apex.	"	"	Survived.
11 J. S..........	M.	Dulness of right upper lobe and left apex.	"	"	Survived.
12 S. D........	F.	Dulness of entire right lung and left apex. Emaciation.	"	Negative	Survived.
13 M.	M.	Scattered areas over both lungs, cavity in left infraclavicular region.	"	"	Survived.
14 C..............	M.	Dulness of left base. Over entire area moist rales can be heard.	"	"	Survived.
15 C...............	M.	Dulness of entire right lung. Rales over area.	"	"	Survived.
16 G. J........	M.	Consolidation of both apices, anteriorly and posteriorly.	"	"	Survived.
17 P. K........	M.	Impaired resonance of right side, rales.	"	"	Death in two months. Caseous nodule in abdominal wall. Tubercles in spleen, liver and peritoneum.
18 H. T........	M.	Diminished resonance over entire left side.	"	"	Survived.
19 J. L........	M.	Consolidation of right apex over right scapula, numerous rales.	"	"	Survived.
20 F.............	M.	Dulness of apices anteriorly and posteriorly.	"	"	Survived.
21 Mc N......	M.	Impairment of left apex and upper lobe of left lung.	"	"	Survived.
22 D. J........	M.	Dulness of left chest above fourth rib, hemorrhages.	"	"	Survived.
23 H. K......	M.	Dulness over both lungs to the third rib.	"	"	Survived.
24 L.............	M.	Dulness of lungs to fourth rib.	"	"	Survived
25 M. A......	F.	Dulness over entire left lung, large cavity at left base.	"	"	Survived.

and close contact with the contagion. Of the 40 cases of undoubted tuberculosis, 35 showed tubercle bacilli in the sputum and 5 did not.

Their technic was as follows: "Six or more ounces of urine were centrifugalized in a water-motor centrifuge and the sediment poured on one or two cover-glasses and allowed to dry thoroughly for 24 to 48 hours. When the crystalline sediment is large in amount it complicates the process and sometimes renders it impossible to find the bacilli. In these cases we always endeavored to

dissolve the sediment with water, a weak solution of caustic potash, a weak solution of acetic acid, or with all three in succession, or even several repetitions of the three. After drying and fixing, the sediment is then stained with carbol fuchsin for five minutes, the stain washed off, the specimen decolorized with 95 % alcohol (or 95 % alcohol in a weak mineral acid) for one or two minutes, then with absolute alcohol for one or two minutes, then further decolorized and counterstained by Gabbet's solution."

Mouillin considers that the secret of finding tubercle bacilli in urine lies in rapid sedimentation by the centrifuge, and immediate staining. He further observes that urine standing sufficiently long to deposit sediment, in the ordinary conical glass, commonly fails to show the organisms, and that examinations under such conditions are of no value.

Boston [6] claims that of over 1,000 specimens of urine examined for tubercle bacilli he has found the organism but three times, "though other acid-fast bacilli have been common findings."

Maragliano,[7] in 12 cases of tuberculosis, as regards the presence of the tubercle bacillus in the urine, concludes with the statement that tubercle bacilli are not found in the urine of persons in whom the infection is localized exclusively in the respiratory organs.

He employed large amounts of urine, which were centrifugalized, repeatedly decanted, and again centrifugalized after the addition of more urine. Slides were next smeared with the sediment, mixed with Meyer's albumin, fixed with heat, and alcohol, and ether, to remove fat and to prevent the staining of smegma bacilli. The specimens were then stained with Ehrlich's solution and decolorized with hydrochloric acid. In none of the 12 cases were any tubercle bacilli found. He then had recourse to the method recommended by Jousset, which consisted in adding to the diluted urine some blood plasma and heating to 100° C., so as to promote coagulation. The coagulum was then separated and redissolved in artificial gastric juice. The last solution was centrifugalized and the sediment examined for tubercle bacilli. Even with this method he was unable to show any tubercle bacilli in the urine of these patients. The injection into guineapigs gave negative results.

Remarks.—This small number of cases scarcely seems to warrant a positive assertion. However, it is safe to say that in pulmonary tuberculosis the tubercle bacillus in the urine is found in only a very small percentage of cases.

If the smegma bacillus was present it would be completely decolorized by using the sweet spirits of niter mixture after the carbol fuchsin. If the urine is carefully obtained with a sterile catheter, the smegma bacillus as a contaminant will be obviated. Personally the reputed frequent presence of this organism in urine is, I think, exceedingly exaggerated.

I wish to extend my thanks to Dr. Georgiana Walter for very valuable assistance.

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THE VALUE OF STEREOSCOPIC SKIAGRAPHY, WITH PRACTICAL DEMONSTRATION.*

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The paper which I am about to read deals with a subject that is unfamiliar to some of you, it not having been presented before this society up to the present time, although it was first employed in this country by Professor Elihu Thomson (*Electrical Engineer,* March 11, 1896), and subsequently used abroad, viz.: The application of the principles of stereoscopy to the art of skiagraphy. To-night I will briefly explain its principles and its technique and a few improvements that I have made in developing the method and making it more practical and simple. These improvements, which will be demonstrated later on, I have no doubt will be interesting to medical men as well as to surgeons.

Photography vs. *Skiagraphy.*—There is a misunderstanding among laymen and even among professional men as to the two terms, photography and skiagraphy. A photograph is an image produced on a sensitive plate in a camera by the ordinary light reflected from the surface of the object converging and passing thither through a lens or pin-hole and then diverging and falling, producing a reduced size of the image on the plate. Therefore, we call a photograph a " reflected " picture, and we see only that part of the object that is near or toward the optical perimeter if the object is not transparent; if it is transparent, then the refraction obscures the clearness of the farther side.

In skiagraphy, on the other hand, working with x ray apparatus, the x rays emanate from a small point (anode), and diverge and pass through opaque bodies (to ordinary light), and throw a relative shade of the object on a sensitive photo-

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graphic plate, producing a merely actual silhouette. There-
fore, an x ray picture, or skiagraph, is produced by transmitted
light.

For instance, if we examine the hand with the fluoroscope
or skiagraph, the shadows are the same as when looking from
the dorsal or palmar side of it, the shadows having equal sharp-
ness, there being no refraction.

When we look at photographs which are taken with one
lens (as if with one eye) and skiagraphs made in one direction,
there is only a flat picture, with no perspective and no relief
effect.

The Purpose of Stereoscopy.—The ordinary photographs and
images look flat, as if seen by one eye, the reflection of one
plane; while stereoscopic pictures, which are made by two
lenses, each being two and a half to two and three quarters
inches from each other (corresponding to the distance of the
two pupils of the eyes), will be impressed on the retina as one
picture, thus giving a perspective view.

Stereoscopic Fluoroscopy.—The stereoscopic fluoroscope con-
sists of a fluorescent screen illuminated by two tubes which
spark alternately. A rotating disc with appropriately placed
slots eclipses each eye alternately. This works synchronously
with the sparking of the tubes. Each eye sees the shadow
cast by one tube. A stereoscopic image is thus seen on the
screen, the movements of the shutter, etc., being sufficiently
rapid to give a continuous illumination of the screen.

Stereoscopic fluoroscopy is very interesting, indeed, it be-
ing possible to see foreign bodies in their exact position, not
as in an ordinary picture. But unfortunately, this method is
impractical for several reasons, the complexity of the appa-
ratus, expense, the bulk, etc.

The Technique of Stereoskiagraphy.—The technique briefly
consists of taking two separate skiagraphs of the same part,
on two different sensitive plates, without changing the posi-
tion of the parts, but displacing the position of the Crookes
tube two and a half to two and three quarters inches (6 cm.),
corresponding to the distance apart of the pupils of the eye.
Afterward these two negatives or skiagrams should be exam-
ined with a special instrument. The part on which the stereo-

scope is to be used should be first fluoroscoped or skiagraphed in order to have an exact knowledge of the location of the injury present. This is most important.

For use in stereoscopic work, there is a slot changing box, measuring fourteen by seventeen inches, the top of which is of thin wood or hard fibre. The size of the plates is marked upon this top in order to correspond to the dimensions on the drawer of the box. Over this box is placed crossed wire, which facilitates the accuracy of superposition while using the stereoscope. The best method in taking stereoscopic pictures is to have a horizontal bar, scaled in inches and centimetres. First centre the object, then move the tube to the right, corresponding to the vision of the right eye (one and one quarter inches), and take a picture. Place a fresh plate in the drawer of the box, which can be done without moving the object, and move the tube to the left, corresponding to the view from the left eye, and take another picture. The plates should be marked " right " and " left," in order not to confuse them after the picture is taken.

Some operators use two Crookes tubes at a distance of seven to eight centimetres, and do not move the tube at each exposure. The objection to this method is that two different tubes will not have the same degree of vacuum, and there is danger of puncturing the tube.

. Johnson and Czermak prefer to move the box two and one half inches instead of sliding the tube.

I have devised a special table and adjustable plateholder, which, to my mind, have many advantages over the other devices in many respects.

This table is so constructed that the tube can be placed to slide on a rod with great ease either on the top, bottom, or side, without discomfort to the patient.

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3

it will be seen, to be brief, that the outer border of the spleen has receded about two inches all around from the previous abdominal markings and that the liver extends but seven-eighths of an inch below the border of the ribs instead of one and a half inch as previously. Unfortunately our therapeutic observation cannot be continued, as the Immigration Commissioners claim the girl, as a public charge, for return to Italy.

The report of the blood examinations by Dr. Rosenberger, and his comments thereon, follow:

January 14*th.* The blood was thin, watery, pale, and of retarded coagulability. In the fresh state the erythrocytes were irregular in size and shape; microcytes, macrocytes, poikilocytes, nucleated forms (normoblasts and macroblasts) and a few pale or indistinct cells were present. There was no apparent increase of white cells, and the polymorphonuclear form was the most prominent.

In the preparation were a number of small bodies, some circular, some slightly oval. Some of these bodies were slightly granular, though most were hyaline. A few contained small fine pigment granules in an amotile state; some were intracellular, while the greater number were extracellular. Hæmoglobin, 34 per cent. (Dare's hæmoglobinometer); erythrocytes, 1,280,000; leukocytes, 10,400 (Dr. Calhoun).

Spreads were stained with Ehrlich's triple mixture, some with Wright's, and others with Jenner's stain. A differential count of the leukocytes resulted as follows: polymorphonuclear, 90 per cent.; lymphocytes, 6.5 per cent.; hyaline cells, 1.5 per cent.; eosinophiles, 2 per cent.

In these stained preparations the bodies above referred to were plainly visible, mostly extracellular and possessing a finely granular, faintly reticulated appearance. Ross' method was also used to demonstrate the parasites with success. Suggestively crescentic-shaped bodies were present.
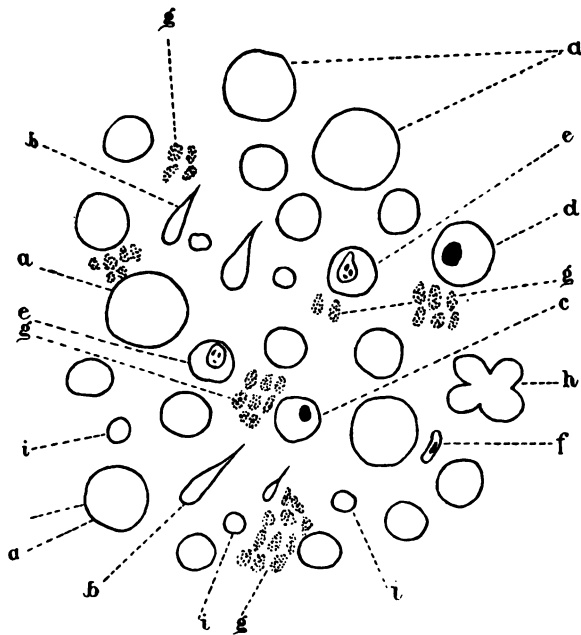
20*th.* At this examination the blood presented the same interesting features.

In fresh preparations were the small hyaline bodies as noted in the first specimen, several of which were slightly motile.

There were few poikilocytes; an occasional nucleated red cell (normoblast) and a few phantom cells were still present, as well as the condition of microcytosis and macrocytosis. In spreads prepared with Wright's stain the bodies were evident; in some there was a background or matrix staining an extremely delicate or pale blue. Hæmoglobin, 45 per cent. (Dare's hæmoglobinometer); erythro-

cytes, 2,640,000; leukocytes, 7420 (Dr. Calhoun). Differential count of leukocytes was: polymorphonuclear, 77.5 per cent.; lymphocytes, 14 per cent.; hyaline cells, 5.5 per cent.; eosinophiles, 2.5 per cent.; basophiles, 0.5 per cent.

In one or two hyaline cells an apparent nucleolus was situated eccentrically. Only two normoblasts were found in each of several spreads examined.

a. Megalocytes. b. Poikilocytes. c. Normoblasts. d. Megaloblasts. e. Intracellular parasites. f. Extracellular parasite suggestively crescentic. g. Blood platelets. h. Deformed erythrocyte. i. Microcytes.

23d. Spreads of the blood were made at twelve o'clock (noon), 2 P.M., 4 P.M., and 6 P.M. In the fresh condition a few spherical hyaline, sluggish bodies were seen in each preparation. There seemed to be no increase in number in the succeeding examinations.

27th. The blood obtained upon this date differed in no respect from that taken four days previously. The bodies were clearly hyaline in the fresh blood, and in the stained spreads a few were seen intracellularly and faintly pigmented.

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degree of penetration of the rays should be as equal as possible.
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and the same tube changes its vacuum during the exposure.
The operator should judge the time of exposure of the second
plate from experience. A self-regulating tube is preferable
in all cases. I have been in the habit of giving a little longer
time for the second exposure than the first, as the tube runs
down a little and the penetration lessens. Short exposures are
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develop them separately, and by carefully mixing the developer
before and during the progress of development I alter it as
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lated according to the degree of density desired; soft nega-
tives are preferable.

METHODS OF EXAMINATION OF STEREOSKIAGRAMS.

Wheatstone's Reflecting Method.—This instrument was de-
vised in 1838, and consists of two vertical mirrors accurately
set at a right angle, the vertex of the angle facing the middle
line of the observer's forehead. This arrangement of mirrors
slides to and fro, and is placed over a long board, upon which a
vertical frame is parallel with the reflecting plane, and forms
an angle of 45 degrees. These frames and mirrors are so con-
structed that the observer can easily superimpose the two pic-
tures.

In placing the pictures in this frame, it must be borne in
mind that they must be so placed as to hold the same position
in the vision as that occupied by the Crookes tube during ex-
posure. For instance, the picture marked " right " should be
placed in the frame to the right of the observer in order to get
an anterior view of the part. If placed in the left frame, a pos-

FIG. 3.—Palmar view of Colles's fracture taken through the splint. If in this stereoscopic picture the position of the negatives is reversed, the stereoscope will show a dorsal view of the hand.

terior view will be obtained. When prints are examined with reflected light, by turning the prints end for end, without changing the " R " and " L " positions, posterior and anterior views may be obtained. This process is a very interesting and valuable one in skiagraphy.

The advantages of the Wheatstone's reflecting method are as follows: Any size negative, even before a print is made, can be viewed. When negatives are used without prints, the picture is seen more in detail; negatives can be examined while wet. I have made two holes in a block of wood which is placed between the reflecting mirrors, where the same reflecting light used for negatives can be placed for illumination of the prints.

Brewster's Refracting Method.—Brewster's refracting or lenticular stereoscope, which is well known, is based on the principle that two pictures are produced by a displacement of two and a half inches, being placed side by side and viewed with two prisms (eighteen degrees) for each eye. These pictures will superimpose according to the laws of refraction. One disadvantage of the Brewster's refractor is the great degree of convergence of the axis of vision which is necessary. Also it is necessary to reduce the size of the pictures for use in this refractor.

Reduced Stereoskiagrams.—(1) Transparencies: Make reduced pictures from the original negatives in the same manner as making transparencies or lantern slides (size, three and one half by three and one half inches), and mount them on a fine ground glass (four by seven inches), and view them with an ordinary hand stereoscope. (2) Reduced Prints: From the transparencies or lantern slides make prints and mount them in two ways. By reversing the " R " and " L " prints, two views of the subject will be observed, and this proves very convenient in studying them, as dorsal and palmar, or anterior and posterior views may be observed.

These reduced size pictures can be put over the desk in the office as a specimen of fracture, foreign body, thorax or skull, for study or to show to the patient. I have made some plastographic views from these stereoscopic negatives. The " plastographic method " is a new one and is patented. The picture is made by superimposing one print in green over another in crimson, giving to the naked eye a very hazy appear-

ance, but when viewed through eye glasses, one green and the other crimson, a very beautiful picture with marked detailed relief meets the eye. I believe this process will be a useful means in illustrating the medical journals and books stereoscopically. There is another method of combining stereoscopic pictures without an instrument, which easily can be acquired, by crossing the visual axes. Place the skiagrams in front, hold up the index finger in the middle line between your eyes and the skiagrams; while looking at the top of your finger, a third picture will appear in the centre with a most beautiful stereoscopic effect.

THE ADVANTAGES AND PRACTICAL USES OF STEREOSKIAGRAMS.

As already pointed out, an ordinary skiagraph is composed of pictures of different densities, which when superimposed look flat and on one plate, and the many shadows are indistinct and weak, but in a stereoscope the superimposition will be more distinct and visible.

Two plates exposed at different angles are used and any deficiency in one is easily recoverable in the other.

Another valuable feature is that two views, viz.: anterior and posterior, are discernible.

The value of stereoscopic skiagraphy is self-evident, as you will see by the practical demonstration with the different methods of observation. Some of the values of this method are as follows:

1. *Anatomy.*—For demonstrating the structure of the bones. In both long and short bones the trabeculæ are seen, and in the long bones we may see the arrangement of the lamellæ in the shafts and in the concellous tissue.

The spiral arrangement of the lamellæ is distinctly shown, especially in the humerus and femur, as also is the change in their direction near the articular surfaces, bringing them into columns perpendicular to the surface of the pressure.

In examining the dry skull the grooves for the meningeal arteries are seen, the concave appearance of the skull processes, the frontal sinuses, the arteries of Highmore, the turbinated bones, etc. It is very interesting to view these results in the living subject as well as in the skeleton. I am now making a series of experiments with Professor M. H. Cryer in order to study the anatomy of the face.

In studying the mechanism of the joints, these pictures

give a perspective view of the relations of the articular sur-
faces of the bones and the actual depth, and the relation of the
processes to the observer.

Arteries, veins, bronchi and excretory ducts, when injected
with opaque materials, such as lead or mercury, show their
exact relations (their depth) to the bones, the muscles, etc.

Surgery.—There are, of course, numerous methods of local-
izing *foreign bodies*, but stereoskiagraphy is the most satisfac-
tory, giving as it does a definite view of the foreign body, en-
abling the surgeon to operate with certainty. In order that
the negative show shadows of different tissues, especially
cystic and soft tumor tissues, the negative should be soft and
full of details.

When two negatives of this kind are superimposed the in-
tensity of the shadows is doubled. Therefore, I am using this
method in Philadelphia Hospital in a series of experiments for
detecting and locating brain tumors, etc.

The foregoing statement is also true with regard to *frac-
tures*. The method procuring definite views of injuries, namely,
the exact position of the fragments the amount of overlapping,
the separation, the degree of apposition in deformities, etc.
The ordinary skiagraph does not show the variety and charac-
ter of a *dislocation*. The stereoskiagraph, however, overcomes
this difficulty, producing a clear and definite view of the exist-
ing condition, so as to differentiate between an anterior and
a posterior dislocation. In viewing the thorax we may see
either an anterior or a posterior aspect, depending on the posi-
tion of the plates. The heart, its position; the aorta, its rela-
tion to the vertebral column; the beautiful cage appearance of
the thorax, the location of a cavity on consolidation, etc., are
interesting and fascinating from a practical and scientific stand-
point. I have been employing this method of stereoscopic
skiagraphy in the Röntgen Ray Laboratory of the Philadelphia
General Hospital for nearly every case.

In closing I desire to express a wish that the members of
this society will be enough interested in the good results of
this method to employ it in preference to ordinary skiagraphy.
I acknowledge that it requires more time and care, but I be-
lieve the results obtained compensate for these seeming dis-
advantages.

PROFESSIONAL BUILDING, 1831 CHESTNUT STREET.

graphic plate, producing a merely actual silhouette. There-fore, an x ray picture, or skiagraph, is produced by transmitted light.

For instance, if we examine the hand with the fluoroscope or skiagraph, the shadows are the same as when looking from the dorsal or palmar side of it, the shadows having equal sharpness, there being no refraction.

When we look at photographs which are taken with one lens (as if with one eye) and skiagraphs made in one direction, there is only a flat picture, with no perspective and no relief effect.

The Purpose of Stereoscopy.—The ordinary photographs and images look flat, as if seen by one eye, the reflection of one plane; while stereoscopic pictures, which are made by two lenses, each being two and a half to two and three quarters inches from each other (corresponding to the distance of the two pupils of the eyes), will be impressed on the retina as one picture, thus giving a perspective view.

Stereoscopic Fluoroscopy.—The stereoscopic fluoroscope consists of a fluorescent screen illuminated by two tubes which spark alternately. A rotating disc with appropriately placed slots eclipses each eye alternately. This works synchronously with the sparking of the tubes. Each eye sees the shadow cast by one tube. A stereoscopic image is thus seen on the screen, the movements of the shutter, etc., being sufficiently rapid to give a continuous illumination of the screen.

Stereoscopic fluoroscopy is very interesting, indeed, it being possible to see foreign bodies in their exact position, not as in an ordinary picture. But unfortunately, this method is impractical for several reasons, the complexity of the apparatus, expense, the bulk, etc.

The Technique of Stereoskiagraphy.—The technique briefly consists of taking two separate skiagraphs of the same part, on two different sensitive plates, without changing the position of the parts, but displacing the position of the Crookes tube two and a half to two and three quarters inches (6 cm.), corresponding to the distance apart of the pupils of the eye. Afterward these two negatives or skiagrams should be examined with a special instrument. The part on which the stereo-

scope is to be used should be first fluoroscoped or skiagraphed in order to have an exact knowledge of the location of the injury present. This is most important.

For use in stereoscopic work, there is a slot changing box, measuring fourteen by seventeen inches, the top of which is of thin wood or hard fibre. The size of the plates is marked upon this top in order to correspond to the dimensions on the drawer of the box. Over this box is placed crossed wire, which facilitates the accuracy of superposition while using the stereoscope. The best method in taking stereoscopic pictures is to have a horizontal bar, scaled in inches and centimetres. First centre the object, then move the tube to the right, corresponding to the vision of the right eye (one and one quarter inches), and take a picture. Place a fresh plate in the drawer of the box, which can be done without moving the object, and move the tube to the left, corresponding to the view from the left eye, and take another picture. The plates should be marked " right " and " left," in order not to confuse them after the picture is taken.

Some operators use two Crookes tubes at a distance of seven to eight centimetres, and do not move the tube at each exposure. The objection to this method is that two different tubes will not have the same degree of vacuum, and there is danger of puncturing the tube.

. Johnson and Czermak prefer to move the box two and one half inches instead of sliding the tube.

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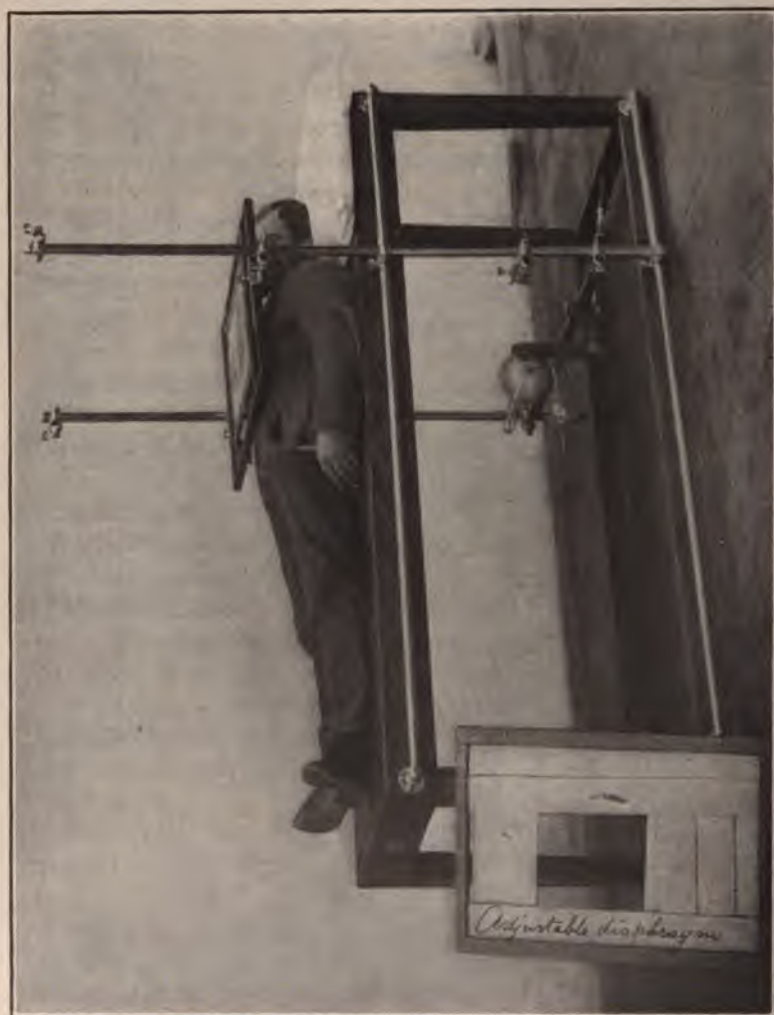
FIG. 1.—Crookes's tube under the table and plate over the chest. The plate can be removed and another substituted without disturbing the patient. This method is specially valuable in locating foreign bodies stereoscopically, because the pressure of the part will not cause any change in the location of it.

FIG. 2.—Sitting position. The plate can be changed without changing the position of the patient in stereoscopic skiagraphy by displacing the tube holder 2½ inches. Any side of plate can be placed. This plate holder can be used for holding the fluoroscope also.

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